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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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Safeguarding of Industry Problems

PUBLICITY was given during last week-end to a statement that "the Board of Trade intends to advise the Government to repeal the Safeguarding of Industries Act, but not the Dyestuffs Act," the latter, it was added for the instruction of the innocent, being a separate measure. Inherently such a report seemed extremely unlikely to be correct, and it was not surprising to find the President of the Board of Trade, in the House of Commons on Monday, describing it as "a piece of pure invention." It may have been an immature Lobbyist's excursion into prophecy of a kind which responsible journals have long ceased to encourage, or it may have been based on current gossip in circles frankly hostile to the Act. The only plausible foundation for such a statement is the variable degrees of official affection felt for the two Acts. It is fairly safe to say that the responsible officers of the Board of Trade, or of the particular department concerned, were really interested in the passing of the Dyestuffs Act, and successfully exerted their influence to have dyestuffs treated separately. In the case of the other Act their interest was dispersed

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over a much wider and less homogeneous field, and in actual administration they have had to wrestle with a much more complicated situation. The suggestion that they favour the repeal of the Act, however, goes against departmental tradition and distinctly against the reputed attitude of high officials. The repeal movement, of which more will probably be heard, comes from quite another quarter.

It must be confessed that the administration of the Safeguarding Act has not been easy, and has caused considerable irritation to traders. The prolonged and costly inquiries, moreover, which the Referee is conducting are not having a good effect. Too much importance, in our view, is attached to the fact that in some instances his decision has gone against the Board of Trade. It would be rather miraculous if, in a list running into thousands and admittedly covering a hazy borderland, individual articles could not be successfully challenged. The Referee, too, has had a very difficult task in the absence of any agreed or generally accepted definitions or even guiding principles. The inquiries, however, tend to impress the public, and the popular effect, we fear, is not favourable to the Act. Last week two more were opened. On the complaint of the Grahame Chemical Co., Liverpool, that mucic acid had been improperly included, the Referee found in favour of the Board of Trade. On the complaint by A. Boake, Roberts, & Co., respecting the exclusion of sulphur dioxide gas (liquid), judgment was reserved. In both these cases the complaints were put forward by representatives of the firm, with results that compare very favourably with the laboured efforts of counsel. The trouble is now added to by the prospects of appeals against the Referee's decisions. In the cream of tartar case the Referee refused an application on behalf of private interests to state a case, but in the gas mantle case, it is reported, he has agreed to state a case for the Divisional Court. The appellants are certain manufacturers who object to an alteration in the wording of the Referee's decision, which, it is contended, leaves the effect of the decision in considerable doubt, and the grounds of appeal are that the Referee was officially defunct once his decision had been given, and, therefore, was not entitled to alter the wording of this award. These legal points, which provide a fine field for legal dialectics, will in due course come up for argument and decision.

Solvent Recovery

IN a number of large industries where no attempt is made to effect solvent recovery "it is not too much to say that many hundreds of thousands of pounds worth of precious material—often representing the heaviest charge in the cost of production—is wasted annually in this country owing to the retention of open systems which are not adapted for solvent recovery, but which are simply chosen as being

easiest." We have selected this quotation as representing, perhaps, the kernel of the Report (No. 8) on "Solvent Recovery," (H. M. Stationery Office, pp. 22, 3s. 3d.), a copy of which has just reached us for review. The Report is the latest addition to that special series "Technical Records of Explosives Supply," which has been issued by the Department of Scientific and Industrial Research in order that the technical advances, made during the war might be collated into permanent form and placed at the disposal of private enterprise. Once more one notices that the burden of the work has fallen upon Mr. W. Macnab, and (as with preceding Reports) we can only repeat our appreciation of the masterly manner in which a troublesome and, perhaps, monotonous task has been carried through.

The Report is concerned with the recovery of ether-alcohol from a process concatenary to the manufacture of cordite. Ether and alcohol are mixed with cordite paste, and subsequently the volatile matter is driven from the material by a process of drying by means of a current of air, the speed and temperature of which are regulated in accordance with the condition of dryness of the cordite. The solvent used for incorporation normally consists of 58 per cent. of ether and 42 per cent. of alcohol, and it has been found that approximately 65 per cent. of the solvent originally used is recoverable. The details given in the Report refer to the work carried out at Gretna, and it is to be noted that the development of solvent recovery is divided into three periods, entailing successively the use of sulphuric acid, water, and cresol. Experience soon proved the inapplicability of sulphuric acid, and laboratory investigations showed that water alone would be little inferior to 55 per cent. acid as an absorbent for alcohol, although it would be useless in respect of ether. Since water, however, would readily permit of the liberation of absorbed alcohol with low pressure steam, and since acid was no more effective than water as regards alcohol, it became evident that water should be substituted for acid until a better solvent could be found. Meanwhile, the utility of cresol (a process patented by Bregeat) was studied, and experiments proved that this medium was an admirable absorbent both for ether and for alcohol. Moreover, both solvents could be regained from cresol merely by distillation with free steam. A cresol plant in which the main feature was a mechanical washer-scrubber, as commonly employed on gasworks for ammonia recovery, was eventually laid down, and the disposition of the apparatus is clearly shown in the line diagrams and half-tone illustrations which are included in the Report. Attention is called to these illustrations in order that, in face of the accusation of waste referred to above, manufacturers may take note of the simplicity of the whole arrangement. The plant, in fact, would appear to be very similar to that found in everyday use in gasworks during the war, when the necessity for benzol stripping became imperative.

The moral of the Report is that chemical industry should no longer be content to stand by in apathy and condone sources of waste which, prior to the war, were regarded as not worth troubling about. It can now be said with certainty that, so far as recovery processes are concerned, the problem is solved, and the question of how much material and money will be saved by an installation nowadays

depends simply upon how much of the solvent-laden air can be conveyed to the recovery plant by the works' management. It is noticed that the agents so far employed in this country have consisted of absorbent liquids. No work has yet been done, therefore, in connexion with silica gel, the claims for which were fully discussed in these columns in our issue of September 25, 1920.

Dye Research and Medical Science

A PAPER of more than usual interest as affecting health problems was read at a meeting of the Manchester Section of the Society of Chemical Industry on Thursday. It was a paper on "The Relation between Chemical Constitution and Antiseptic Action in the Coal Tar Dyestuffs," by Thomas H. Fairbrother, M.Sc. (Vict.), A.I.C., and Arnold Renshaw, M.D. (Lond.), D.P.H. (Manc. and Cantab.). It illustrated the success which may attend collaboration on the part of industrial scientists such as Mr. Fairbrother, who is a member of the technical research staff of the British Dyestuffs Corporation, and investigators of pathological problems such as Dr. Renshaw, who is a member of the pathological staff of the University of Manchester, pathologist to Ancoats Hospital, and bacteriologist to the Manchester Royal Eye Hospital. Both have been doing research work for nearly four years on the antiseptic action of certain dyes on bacteria and the lethal action of the same dyes on protozoa.

The full report of the meeting has not yet reached us, but from some advance notes on the paper, kindly supplied by Mr. L. Guy Radcliffe, hon. sec. of the Manchester Section, it appears that the work described by the authors has been conducted along lines in which the chemical constitutions of the dyestuffs were carefully considered, and certain dyes have been found which possess powerful antiseptic properties. These are coal tar derivatives, and typical members of the different groups of dyes have been examined. Certain dyes of the azo class show so little antiseptic action that even moulds can grow in them in a concentrated solution. There are, however, other groups such as the triphenylmethane group, the safranines, the oxazines, and the acridines which exhibit antiseptic properties in varying degrees. Some of these are most powerful antiseptics, preventing the growth of organisms like typhoid and anthrax bacilli in dilutions of 1 in 5,000 and killing certain protozoa in dilutions of 1 in 20,000, while the latest results indicate that with certain mixtures of dyes the action in regard to protozoa can be extended to a dilution of 1 in 120,000 of these dyes.

In the course of the paper, the whole field of medicine was reviewed, and indications given as to which diseases, in which known agents are at work, still remain without a definite cure. The present work is along the lines of Ehrlich's chemio-therapeutic research which resulted in the preparation of salvarsan. In this work some of the test agents employed were found not to be affected by neo-salvarsan, 1 in 200, whereas, with the dyes employed, antiseptic action was at once noticed in dilutions of 1 in 2,000, and, after fifteen minutes, in dilutions of 1 in 20,000. Experiments would appear to indicate that some of these substances may possibly be given intravenously into human beings, and further work

on these lines is being undertaken. Experiments have been conducted on animals with some success. Indications will be given later as to the manner in which medical men now await further chemical advances. Accurate diagnosis now awaits specific treatment. Thus the known agents of typhoid, dysentery, and cholera can be recognised easily, to mention only a few, while with tropical diseases there is a vast field to explore in such cases as malaria, sleeping sickness, kala azar, and filariasis with regard to which, with the exception of malaria, very little has been done, and even in the case of malaria a better agent than quinine may be found. Modern medicine, it was pointed out, will undoubtedly have to progress along the lines of applying a precise specific chemical substance to kill off a known infective agent. This is already done in some diseases, such as diphtheria, where diphtheria antitoxin can be given, and syphilis, in which salvarsan is used, but this merely represents the fringe of the field yet to be explored. When this work has been done the amount of suffering in the world should be enormously reduced by killing the infective agent in the early stages before gross damage to tissues has resulted.

The British Dyestuffs Corporation Ltd., Blackley, have shown great interest in the work undertaken by the authors of the paper. The company are affording every facility in their power to the investigators with a view to making the results obtained of great practical value to the medical profession and to the general public. The results in this single case demonstrate the vital importance, outside the purely industrial and commercial fields, of a national dyestuffs organisation, with ample resources for research work.

A Double-Edged Argument

SIR WILLIAM BARTON, M.P., in a statement to the London correspondent of the leading Lancashire Free Trade journal, uses an argument which seems to us to discredit his own case against the Dyestuffs Act and to emphasise the national necessity to meet which that measure was passed. Enlarging on the difficulty of securing licences to import "certain special dyes," he states that when a licence is eventually obtained—

Then the inquiry is sent out to Germany to get the dyes. The Germans know perfectly well that this is an order that can only be filled by themselves; otherwise a licence would not have been obtained. Knowing that, they can, and quite rightly do, make their own price. Many dyes are up in price from 400 to 800 per cent.

Sir William apparently approves this familiar German policy of "quite rightly" charging British dye-users the highest possible figure for any dyes of which Germany still has a monopoly, but he quite misses the much larger and quite obvious inference that where we are producing our own dyes the old German monopoly is broken and British dye-users are getting the advantage of competition in cheaper goods. What Germany is doing in the case of these "special" dyes—charging monopolist figures which become a tax on British dye-users and the collateral trades—she would assuredly do with all dyes if her monopoly were once re-established, and British industries dependent on dyestuffs would be once more at the mercy of their most ruthless competitor. It was to save British industry from this fate that the policy of making this country independent of German supplies was first

embarked on. Sir William would cheerfully wreck that policy and sacrifice the remarkable progress already made by enabling Germany to flood this country with cheap dyes until the British home industry had been destroyed, and then to recoup herself by charging us monopolist prices. This is Free Trade gone mad. The member for Oldham seems to us to have given himself and his cause very badly away.

Points from Our News Pages

- Reports of further proceedings under Part I. of Safeguarding of Industries Act are reported (pp. 418-21).
 At a meeting in London on Tuesday it was decided to form an Institute of Chemistry Students' Association for London (p. 421).
 The relative advantages of elutriation, sedimentation, and centrifuging were discussed at a joint meeting of the Faraday Society and the Oil and Colour Chemists' Association (p. 425).
 Dealing with the indigo situation in India, Professor H. E. Armstrong entered a plea for the continuation of research on natural indigo (p. 422).
 In his second Cantor lecture on the "Constituents of Essential Oils," Mr. G. Radcliffe emphasised the importance of straight chain compounds (p. 426).
 Our London Market Report records a continuation of the improvement in the demand for chemicals, orders generally being confined to early requirements (p. 435).
 Our Scottish Chemical Market Report describes business as rather slow this week, but prices as fairly well maintained (p. 437).

The Calendar

April		
3	Royal Institution: General meeting. 5 p.m.	Albemarle Street, Piccadilly, London.
3	Royal Society of Arts; Cantor Lecture III.: "The Constituents of Essential Oils." L. G. Radcliffe. 8 p.m.	John Street, Adelphi, London.
3	Society of Chemical Industry: "The Influence of Structure on the Combustibility and other properties of solid fuels." E. R. Sutcliffe and E. C. Evans. 8 p.m.	Burlington House, Piccadilly, London.
4	Hull Chemical and Engineering Society: Presidential address: "The Influence of Science in Human Life." 7.30 p.m.	Wilberforce Café, Hull.
5	Society of Public Analysts: Ordinary meeting. 8 p.m.	Burlington House, London.
6	Chemical Society: Ordinary Scientific meeting.	Burlington House, Piccadilly, London.
6	Optical Society: Papers by H. H. Emsley, E. F. Fincham, and E. W. Taylor. 7.30 p.m.	Imperial College of Science and Technology, South Kensington, London.
6	Royal Society: Papers by F. E. Smith, G. I. Taylor, Professor T. H. Havelock, G. R. Goldsbrough, C. Spearman, and Dr. W. L. Balls.	
6	Society of Dyers and Colourists, West Riding Section: "The Finishing of Fine Worsted and Woollens." A. Jackman.	Bradford.
7	Society of Chemical Industry, Manchester Section: Annual General Meeting. "Oil Fuel, its Application and Economic Limitations." Professor J. S. S. Brame	Textile Institute, Manchester.
7	Safeguarding of Industries Act: The Hearing of the Gas-Mantles Appeal.	Law Courts, London.
7	Royal Institution: "Radio-activity" (Lecture VI.). Sir E. Rutherford. 9 p.m.	Albemarle Street, Piccadilly, London.

The Safeguarding of Industries Act

Further Proceedings before the Referee

Further proceedings before the Referee appointed under Part I. of the Act are reported this week. The Referee has refused to state a case in the cream of tartar inquiry; on a complaint by the Grahame Chemical Co. that mucic acid is improperly included in the Board of Trade list, he has decided in favour of the Board; his decision on a complaint by A. Boake, Roberts, & Co., Ltd., against the exclusion of sulphur dioxide gas (liquid) is reserved. To-day (Saturday) an inquiry will be opened respecting the inclusion of synthetic camphor. The Referee has stated a case for the decision of the courts on his recent award in the gas mantle case.

THE Board of Trade issue the following list of decisions by the Referee in arbitrations under Section 1 (5) of the Act. Against the name of the article is shown the decision of the Referee, i.e., whether it has been properly or improperly included in, or excluded from, the lists of articles chargeable with duty under Part I. of the Act:

Article.	Judgment.
Calcium Carbide	Properly excluded.
R. Lactose	Improperly included.
Cream of Tartar, Tartaric Acid, Citric Acid	Improperly included.
Planimeters and Integrators (Planimeter type)	Properly included.
Calculating Cylinders	Properly included.
Mucic Acid	Properly included.

In two cases, viz., that of R. Lactose and that of Cream of Tartar, Tartaric Acid, and Citric Acid, the decisions are against the Board of Trade, and those substances are accordingly withdrawn from the lists of dutiable articles as from March 25, the date of signature of the awards.

Sulphur Dioxide Gas (Liquid)

MR. CYRIL ATKINSON, K.C., the Referee, heard a complaint on Friday and Saturday, March 24 and 25, by A. Boake, Roberts, & Co., Ltd., of Stratford, against the exclusion of sulphur dioxide gas in liquid form from the list issued by the Board of Trade of substances taxable under the Act. Mr. E. J. Boake and Dr. Joshua appeared in support of the complaint, and the Board of Trade was represented by Mr. Ronca, of the Department of Industries and Manufactures. The Board of Trade hold that this substance is a heavy chemical and should therefore not be included in the list.

The Complainants' Case

MR. E. J. BOAKE, who presented the case for the complaint, urged that sulphur dioxide gas in liquid form was a pure product and that its manufacture necessitated constant skilled chemical supervision, that it was produced in relatively small quantities, and was employed in laboratory research work, in connection with the preparation of foodstuffs and in the manufacture of dyestuffs. On these grounds he contended that SO_2 should have been included in the list as a fine chemical. He wished to make it quite clear that there was a chemical difference between sulphurous acid and sulphur dioxide liquid. Sulphurous acid was a body represented by the formula H_2SO_3 , which exhibited acid properties. Thus it was capable of reacting on bases to form salts, a property not shared by the anhydrous material represented by the formula SO_2 , and designated sulphur dioxide liquid. It might be urged, he said, that SO_2 in the gaseous liquid or solid form was the same chemical substance, and from this contention he was not prepared to differ. He was asking that liquid sulphur dioxide be put in the list because (1) his firm was only concerned with the product in this form; and (2) it was not obtainable commercially in the gaseous or solid form. Further, sodium bicarbonate was the raw material from which soda carbonate (a heavy chemical) was produced; therefore soda bicarbonate could not be a fine chemical, but it was included in the list. There was a very wide difference between the SO_2 gas used in the manufacture of sulphuric acid and sulphur dioxide. The former existed to the extent only of 6 per cent. mixed with certain quantities of oxygen, nitrogen, and SO_3 , whereas SO_2 was a commercially pure anhydrous substance free from SO_3 . In the manufacture of sulphuric acid, SO_3 was an inevitable but not objectionable ingredient, whereas the presence of SO_2 in sulphur dioxide was absolutely inadmissible. It was therefore evident that in the manufacture of sulphuric acid a very impure form of SO_2 could be, and always was, employed, whereas in the manufacture of sulphur dioxide extreme purity was an essential condition. Sulphur dioxide was a chemical of a high degree of purity, and to attain this result constant skilled and chemical supervision was necessary to examine the raw materials and

test the gas at various stages of its manufacture, and also to test the final product.

Reference Books and Lists

Whilst a reference to the ordinary text books would give a superficial knowledge of the method of manufacturing this gas, he handed in to the Referee two plans showing part of the plant necessary for the production of sulphur dioxide in the compressed form, which he submitted were sufficient to show the complicated nature of the apparatus necessary. Such importance did the firm attach to scientific investigation of problems connected with the manufacture of sulphur dioxide liquid, that his company had selected certain members of the staff to form an SO_2 Committee, and this committee had been sitting at intervals for two years. There was a chemist in charge of the plant which worked night and day, and during the night shift a foreman was in charge. At present there were two units in operation, the output being 10 to 15 cwt. per day per unit, and the plant worked continuously throughout the year. So far as he knew, his company were the only manufacturers of sulphur dioxide in this country and they had been making the material for the past forty years. Since 1914 the trade had been very much disturbed on account of the war and subsequently by the slump in trade, but in support of the contention that sulphur dioxide liquid should be classified as a fine chemical, he mentioned that in 1912 his firm's output was 1 ton 4 cwt. per week, and in 1913 about 1 ton 6 cwt. per week. These quantities included a certain amount of export business, but these figures—and he suggested we were back again to about the pre-war level—bore no relation to the sulphuric acid which was produced in this country during the same period, which was at the rate of 1,062,000 tons, viz., 22,000 oleum and 1,040,000 tons chamber. SO_2 was universally employed in this country in all laboratories as a laboratory reagent for the preparation of sulphurous acid solution, an unstable body which it was necessary to prepare in a fresh state, and also for all purposes where a supply of pure SO_2 might be necessary. Sulphurous acid solution was an analytical reagent. Owing to its high state of purity it was relied on as a source of pure gas without question. It was also used in the preparation of foodstuffs and dyes. Users insisted upon its absolute freedom from arsenic, sulphuric acid, and other deleterious bodies. To a limited extent it was also used as a refrigerating agent and also for the purification of water.

On reference to the German lists of chemicals published by Merck and Kahlbaum, it was to be noted that there was no reference to sulphur dioxide, but this omission could only be accepted as negative evidence. It might be that the sulphur dioxide prepared and put up by his company was not obtainable in Germany and therefore there would be no reference to it in these lists. The list issued by British Drug Houses, Ltd., also omitted reference to it, but the name "British Drug Houses" implied that this house dealt primarily with drugs and druggists, and it was not contended that SO_2 was a drug or that it was ordinarily to be found in druggists' shops. In White's "Analytical Reagents, Standards and Tests," sulphurous acid solution was referred to and was stated to be a saturated solution of sulphur dioxide in water. Here, again, the gas made by his company was applicable and was generally employed. All reference to sulphur dioxide was omitted from the list of analytical reagents issued by the Institute of Chemistry and the Society of Public Analysts; but that was understandable, as it was a proprietary article, and in making reference thereto in publications of this kind, the compilers might be charged with giving undue notoriety to one particular firm. Furthermore, sulphur dioxide could be prepared in the laboratory by chemical methods. Turning, however, to the British literature, it would be found that Baird & Tatlock in a list dated 1920 referred to "sulphurous acid anhydrous in syphons" and also in a list dated 1922. Again, Townson & Mercer in their list dated August, 1912,

under the heading of pure chemicals, referred to "sulphurous acid anhydrous in syphons," and again in a list dated 1920. Harrington Brothers, in their list of fine chemicals, also referred to "sulphurous concentrated anhydrous, in syphons." All these firms were fine chemical manufacturers. All these references related to the product of Boake, Roberts, & Co., because they were the only manufacturers in this country. Further, traders who handled SO_2 in this country regarded it as a fine chemical.

THE REFEREE said that in previous cases it had been said that one test of fine chemical manufacture was that the plant could be used for many purposes, but in this case it appeared to be a special plant for this particular purpose. That was what was associated with heavy chemical manufacture by some of the previous witnesses.

MR. BOAKE said he should be inclined to dispute that view of a fine chemical plant. He was a fine chemical manufacturer and to say that all fine chemicals could be turned out with one plant like a cook could turn out a dinner with one set of utensils was untrue. His firm made, perhaps, 5,000 chemicals, and they had a research laboratory at Oxford where research was carried out specially into these problems, and the great bulk of the chemicals were not made in the same plant.

THE REFEREE: Then you think there is more specialising in fine chemical plant than I seem to think?

MR. BOAKE said he undoubtedly thought there was. In the manufacture of some things, such as the ethers, it was possible to make twenty or thirty ethers with the same plant, and to that extent the suggestion of the Referee was true, but in a general sense it was not correct. Salicylic acid was a fine chemical, and it was made with a special plant of its own.

Board of Trade Views

MR. RONCA asked a series of questions on behalf of the Board of Trade, and during a portion of this part of the proceedings the public and the press were asked to withdraw, as Mr. Boake did not wish certain information he gave to be made public. The case for the Board of Trade is that by the nature of the manufacture and the type of plant used, SO_2 must be regarded as a heavy chemical. Questions were put suggesting that because a chemical was used as an analytical reagent it was not necessarily a fine chemical, and Mr. Boake suggested that SO_2 could very well come within the definition of both a heavy and a fine chemical.

THE REFEREE called attention to the fact that in Germany SO_2 was sent about in tank wagons holding 10 tons.

MR. BOAKE explained that the chemical industry in Germany was amalgamated in the I.G., and that all SO_2 , for instance, would be made in a certain works and distributed to the others, and he imagined that that was what the wagons were for. He had seen this happen with nitric acid and other things, and in effect the wagons were in the same works all the time.

In answer to further questions, Mr. BOAKE agreed that it would be more difficult to make many fine chemicals than SO_2 , but others were easier to make. He thought the scale of manufacture was comparable with fine chemical manufacture generally.

THE REFEREE said this was a difficult case and he did not wish it to be hurried.

MR. BOAKE said that in his opinion the industry had been very much involved by the use of an adjective which was, if he might say so, improper, and not definite in its meaning. A fine chemical in his opinion was a commercially pure chemical.

THE REFEREE said that that meant that with every chemical there was a grade which was a fine chemical.

MR. BOAKE said that was so.

THE REFEREE said he did not think that would do, because it was possible to buy commercially pure sulphuric acid, and that was not fine.

MR. RONCA said that "commercially pure" did not mean pure. There were many chemicals which were called commercially pure which meant that they were something better than the crude.

MR. BOAKE said that the higher quality was generally accepted in the trade as commercially pure. His view was that any chemical, irrespective of whether it was ordinarily called a fine or a heavy chemical, in a certain state and condition became a fine chemical, but he was not prepared to say what that state and condition was in every case.

THE REFEREE said he had heard a tremendous lot of evidence on this point, and he had been told that many

admittedly heavy chemicals were wonderfully pure, just as pure as many fine chemicals, but they were sold in enormous quantities and had been regarded as heavy chemicals for so long that no one would dream of suggesting they were fine chemicals. One of the things which was of importance, in his view, was whether they were made by fine chemical manufacturers.

MR. RONCA, dealing with the case for the Board of Trade, laid stress on the question of purity, and his contention was that the degree of purity in this case was no higher than that of sulphuric acid.

MR. BOAKE said that 6 per cent. had been mentioned as the degree of purity for the manufacture of SO_2 gas by the catalytic process, but that would be absolutely useless for the liquid SO_2 which he made.

MR. RONCA also said that many thousands of tons of SO_2 gas was made during the war in connection with the manufacture of sulphuric acid, and the quantities were too big to enable it to be called a fine chemical. There was also the question of the plant involved, which he contended was essentially of the nature used in the manufacture of heavy chemicals.

THE REFEREE said if he were to go on weight alone it seemed to him that it would be very difficult to say it was a fine chemical.

MR. BOAKE agreed as far as SO_2 gas was concerned, but reminded the Referee that the application was as regards liquid SO_2 .

MR. RONCA agreed that the quantity of the liquid made might bring it within the fine chemical term, but he understood the purity was 99.8 per cent., which was not so pure as sulphuric acid from the oleum or contact processes.

THE REFEREE suggested that even judged from the point of view of purity it would be fine.

MR. RONCA, after consideration, said he was prepared to accept that, from the point of view of quantity of liquid and purity, it might be regarded as "fine," but the plant was such as would be regarded as a heavy chemical plant.

THE REFEREE said it appeared to him to be one of the borderline cases which pointed both ways.

Asked whether but for the plant he would call this a fine chemical, Mr. Ronca said he would not. In making out the list the Board of Trade had no difficulty in the great majority of cases in deciding whether a chemical was fine or heavy. It was more or less a question of what was the practice, and on that test the Board said that SO_2 liquid had never been regarded as a fine chemical. It was regarded, in the preparation of the list, in the same light as compressed oxygen, carbon dioxide, or liquid chlorine, which were also sold in large quantities in steel cylinders.

THE REFEREE suggested that it might be typical of the intermediate zone which had been spoken of in previous cases. Unless he could be satisfied it was a fine chemical, it would have to stop out of the list. It must be found, as a fact, that it was a fine chemical.

MR. BOAKE put it to Mr. Ronca that phosphoric acid and many of the sources of phosphoric acid were in the list as fine chemicals, and yet phosphoric acid was manufactured in plant which one would ordinarily call heavy chemical plant. That was permanent plant, and he had many plants capable of producing many tons a week which were lying idle because they could not be used for any other purpose and because trade was so bad. His point was that phosphoric acid was made in plant which was specialised and could not be used for any other purpose. It was not built up in units, and yet the material and its salts were considered by the Board of Trade to be a fine chemical. The whole of the plant appertained to heavy chemical manufacture. Again, quite a number of the sulphides were in the list as fine chemicals, and the reason why SO_2 liquid had not been included was, he suggested, because of its association in the mind of the Board of Trade with sulphuric acid. There had been too much confusion between the liquid and the gas. SO_2 gas and SO_2 solid were not marketable, and he suggested that SO_2 gas, which was the starting point for sulphuric acid, was in a very different category from SO_2 liquid. Moreover, there were many things in the list which were not of such great purity as SO_2 liquid.

Decision Reserved

THE REFEREE said he would have to take time to consider his decision.

Mucic Acid Inquiry

ON Thursday, March 23, Mr. Cyril Atkinson, K.C., the Referee, heard a complaint by the Grahame Chemical Co., of Victoria Street, Liverpool, agents for the International Chemical Products Co., of America, that mucic acid had been improperly included in the list, and should be taken out.

New Canadian Process

MR. T. R. MARSHALL (Grahame Chemical Co.) said his contention was that mucic acid was a heavy and not a fine chemical, and was being made in bulk quantities. The International Chemical Products Co. was formed to run a patent process evolved by Professor Acree, of Harvard University, for obtaining mucic acid commercially from larch. Works at Eureka, Montana, were turning out mucic acid by this process, and at present the output should be about 2 tons per day.

THE REFEREE pointed out that the output mentioned by Mr. Marshall would amount to about 600 tons a year, whereas he had been told that the smallest output of an admittedly heavy chemical was something like 62,000 tons a year.

MR. MARSHALL said that the product concerned was a new article, produced by only one works in the world, and those works had only just got going. Also, Professor Acree had obtained an option over some large woods in Canada, and works would be erected there as soon as the first factory was a paying concern.

THE REFEREE said that in September, 1921, the Eureka works were not turning out mucic acid in commercial quantities.

MR. MARSHALL said that was due to the breaking down of one of the stills.

In reply to a number of questions put by the Referee, the witness agreed that mucic acid was a fine chemical until Professor Acree's discovery was made; it was a typical fine chemical, with no industrial or commercial use. He contended, however, that the new discovery made it possible to turn it out at a very low price and in large quantities, which made it a heavy chemical. Mucic acid was obtained from sawdust from larch, and by the new process galactose was obtained; this was further treated to obtain mucic acid. Previously, mucic acid had been obtained from lactose, and the like, but the price of 18s. or 19s. per lb. compared with a selling price of 1s. per lb. for the mucic acid produced at the Eureka works. It could not be turned out at that price if the process involved the employment of highly paid scientific workers, and on that ground also he contended that the product was not a fine chemical.

THE REFEREE said that the position was a curious one. The product was, at the time of the passing of the Safeguarding of Industries Act, a fine chemical, judging by the tests suggested. Then a discovery had been made, which cheapened the cost of production to the vast extent indicated, and it was contended that it was a heavy chemical.

MR. MARSHALL pointed out that the Act was passed for the protection of industries.

THE REFEREE: For the protection of the fine chemical industry, and others. The object of the Act was to encourage the manufacture of the substance in this country.

MR. MARSHALL said it could not be produced here, because the larch could not be obtained. At Eureka Professor Acree had an option over woods which would keep the works going for ten years, and in Canada he had an option over woods which would keep contemplated works there in operation for twenty years. If the company could have got an option over a forest in this country sufficient to warrant the erection of works here they would have considered that from the first. He agreed that the only trade usage which existed here was one which called mucic acid a fine chemical.

Board of Trade View

MR. RONCA, of the Board of Trade, when asked whether the facts stated were known at the time mucic acid was listed as a fine chemical, said they were not. The Board's attitude was that, whereas it was admitted that the manufacture of mucic acid by Professor Acree's process only started in December last, the Act came into force before that time. Many industries had developed through the discovery of new sources of raw material, but the discovery of a new source of raw material did not necessarily convert the product from a fine to a heavy chemical, even supposing that that view could be held for the purposes of the schedule, which the Board contended could not. He instanced thorium

nitrate; when it was found that this could be better produced from monasite sand than from thorianite, it did not alter the fact that thorium nitrate was a fine chemical.

THE REFEREE said that that might operate in the opposite direction as well; if a heavy chemical were produced by a more complicated process, involving higher skill, it might become a fine chemical.

MR. RONCA, continuing, said the Board contended that it was the date of the operation of the Act that counted. Then there was the question of production and the amount imported into this country up to the present. Assuming that 600 tons per annum was produced, this was the whole world's output. He ascertained from Mr. Marshall that only 50 lb. of mucic acid from the Eureka works had been imported into this country to date. Also, he said that it was asked that the list should be altered because a certain new patent had been obtained. They did not know that the process was going to be a success. There had already been an accident at the works, and there might be others. There was not one patent in twenty that reached commercial success, and there was no guarantee that this particular process would be working in a year's time. Hitherto the discussion had been confined to whether or not the product was a fine chemical, but the Board submitted that mucic acid was a synthetic organic chemical, within the meaning of the schedule.

THE REFEREE said he felt a difficulty, in that twelve months ago everybody would have agreed that the substance was a fine chemical; that was the position when the Act was passed.

MR. MARSHALL said that the patents were taken out in March, 1920, and the Act only came into operation in October.

To Remain in the List

After further argument the Referee pointed out that as soon as the article was produced in Canada it could be sent here duty free. Although that was not encouraging manufacturers here to produce it, it was encouraging the Canadian manufacturer, and the Empire would benefit. That was an illustration of the operation of the Act. He had no doubt at all—and this was his decision—that the substance was properly included, and he could not say it was improperly included at the time the Board of Trade were dealing with it. If the Board were dealing with it to-day they would still have no option, strictly speaking, but to include it as a fine chemical, although they might take the broader view that it might as well be left out. Also, he was inclined to think, but did not decide, that it was a synthetic organic chemical.

Cream of Tartar Award Signed

MR. COURTNEY TERRELL, on behalf of Kembell, Bishop & Co., and the Phoenix Chemical Co., made an application to Mr. Cyril Atkinson, K.C., on Saturday, March 25, to state a case on certain points of law arising out of the decision given a week previously.

Before the application was made, the Referee asked if the Board of Trade had given consideration to the question of asking him to state a case, for which a week had been granted the Board at the time the decision was given.

MR. RONCA, for the Board of Trade, said it was not their intention to ask the Referee to state a case.

MR. COURTNEY TERRELL then asked that a few days should be given him in which to frame the application and argue it.

THE REFEREE said that personally he could not see what points of law could arise, but in any case he was not prepared to give further time. The application must be dealt with now.

MR. COURTNEY TERRELL said his first point was that the Referee should have defined the term "fine chemical," and not merely said that there was no definition; secondly, in the absence of a trade definition, the Referee was not bound to consider trade usage at all, and if he were right in that respect, then he should not merely have taken the trade usage of merchants and brokers but also of manufacturers; and lastly, the Referee should have had regard only to the circumstances of manufacture and not to the use to which the article was put.

THE REFEREE said the position was a little difficult because these proceedings were really arbitrations between the complainants and the Board of Trade, although other parties were allowed to take part. In this instance the Board of Trade did not ask him to state a case, and if it were possible for a firm or firms supporting the Board of Trade during the hearing to ask him to state a case, when the Board of Trade did not, then so far as his discretion was concerned, he should consider

whether other parties should be allowed to be heard in future cases. He refused to grant any further time, and told counsel he must do the best he could in the absence of Sir Duncan Kerly, K.C., his leader. There were three points to deal with in relation to this application, (1) whether Mr. Terrell had any right to make the application; (2) whether the points raised were points of law; and (3) the fact that until the decision had been given in the cream of tartar case no indication had been given that he would be asked to state a case. In his opinion a case ought not to be stated unless he were asked to do so during the hearing, as was done in the calcium case. If he decided to sign the award, there would be no hardship on Mr. Terrell's clients or, indeed, on either side, and Mr. Terrell could then move for the decision to be set aside on the ground that he had been guilty of misconduct in refusing to state a case.

SIR ARTHUR COLEFAX, for the complainants, said the holding up of the signing of the award was a very serious matter, because it would mean that the tax would continue to be levied.

THE REFEREE agreed and added that the Board of Trade had intimated that if they had asked him to state a case they would have removed the substances from the List until a decision was reached.

MR. RONCA said the Board would do the same in the present case if the application were granted, but the Board were not identified with the application.

THE REFEREE said he doubted whether in law the Board of Trade could do that. He did not believe that it was intended that there should be cases stated at all, but that his decision should be final, as was stated in Sec. 5 of the Act. He did not believe that the House of Commons in passing the Act expected that cases would be asked for on imaginary points of law, because he did not, with all respect, regard the points put forward as points of law.

MR. COURTNEY TERRELL: If you do not think these are points of law—

THE REFEREE: Honestly I do not.

Later, the Referee said he did not say positively that Mr. Terrell had not a right to make this application, although he did not think he had, but he certainly would not grant the application for a case to be stated unless he was satisfied that there were real questions of law involved, and in this case he could see none. He did not think it would be reasonable. The case took nine days, and he felt very strongly about it, because it had put everybody to great expense, and he was not going to shirk his decisions by going to a Court and asking how to make his decisions. He did not believe that was intended, nor did he think it was right. If he was wrong, then Mr. Courtney Terrell could move for the award to be set aside. He wished it to be quite clearly stated that one of the grounds for signing the award now was the doubt as to whether the Board of Trade could take cream of tartar out of the List pending a decision of the Court.

SIR ARTHUR COLEFAX said there was one special reason why he asked that the award should be signed now, and that was that the present time of the year was the period when business was done in cream of tartar.

THE REFEREE finally signed the award (the terms of which were reported in THE CHEMICAL AGE of March 25).

Gas Mantles: The First Appeal

MR. CYRIL ATKINSON, K.C., the Referee, has stated a case for the decision of the courts in connexion with his award in the gas mantle case. The matter will come up before the Divisional Court on April 7. The case for the courts has been stated at the instance of the gas mantle manufacturers in this country, who take objection to an alteration in the wording of the Referee's decision after it was delivered which, they say, leaves the position as to the real effect of the decision in considerable doubt. It is also contended that the Referee was *functus officio* after he had delivered his decision in the first place, and therefore was not entitled to alter the wording of the award. The Referee stated at the time that the alteration in wording was only intended to give effect to his intention.

Synthetic Camphor

We are informed by the Chemical Merchants' and Users' National Vigilance Committee, London, that the Referee will begin to-day at the Board of Trade the hearing of a case dealing with synthetic camphor, which is included in the Board of Trade's list.

The Institute of Chemistry

Formation of a Students' Association

THE inaugural meeting of the Institute of Chemistry Students' Association, London, was held at the Institute on Tuesday evening, Mr. E. R. Bolton, F.I.C. (chairman of the London Section of the Institute), in the chair. Some sixty students representative of all the recognised London colleges and of industrial and analytical laboratories were present.

Mr. Collett, secretary of the London Section, outlined the negotiations which had led to the calling of the meeting and the chairman then invited discussion upon the proposal to form an association and upon the draft rules of the Association, the objects of which are to arrange meetings of registered students of the Institute to discuss matters of professional and student interest, to provide lectures, to arrange exhibit evenings, social evenings and debates, to arrange visits to works in the neighbourhood of London, and generally to promote the interests of registered students, and in every way possible to co-ordinate and co-operate with the chemical societies of the recognised colleges in or around London. Miss Tookey put forward an amendment to the effect that, instead of forming a separate association, arrangements should be made for students to be present at all meetings of local sections. She felt that in this way students would come into intimate contact with fellows and associates, but that a separate association would be a misuse of student energy.

Mr. Marlow, in reply, urged that the mere attendance of students at local section meetings would not meet the case, since the students would be visitors without voting power, whereas the proposed association would be run by students for students, and contact would be made between them and the fellows and associates who were really interested in student life by means of the grade of honorary membership of the association. Law students formed very valuable friendships at similar gatherings, and they were brought to realise that they had entered a great fellowship, whereby the most junior student was for the time on equal terms with the most eminent lawyer. He felt sure that those present would agree that the profession of chemistry should aim at acquiring the *esprit de corps* which existed in the profession of the law, and the formation of a separate association was absolutely essential for this purpose. Moreover, there were frequently topics for discussion at local section meetings which did not interest students—which were domestic matters for the consideration of the members of the Institute.

Mr. Prince remarked that, if students were merely invited to attend one another's chemical societies, they attended as strangers, but through the association they would all meet on common ground and would form friendships which would prove of lasting benefit to the profession.

Miss Tookey thereupon withdrew her amendment and the association was declared duly formed. The provisional committee which had drafted the rules was instructed by the meeting to carry on the business of the association until the annual general meeting in May.

The chairman then called upon Mr. Richard B. Pilcher, the registrar of the Institute, to deliver a short address on "Students' Societies, with special reference to the work of similar Societies formed under the auspices of other Chartered Bodies."

Mr. Pilcher spoke with special experience of the Chartered Secretaries' Students' Society, of which he had been the first president. The association which had now been formed would not in any way interfere with college associations, but would rather co-operate with them; and, at the same time, provide a common ground where the junior fellowship of the profession of chemistry could meet, affording opportunities for extending among the chemists of the future those ties of good feeling and friendship which were so valuable in after life. Even before the war Professor Meldola, who was then president of the Institute, had discussed with him proposals for arranging monthly students' nights, and, therefore, he was very glad when Mr. Murdoch raised the matter afresh. He believed that before long the association would prove that its existence was all for the good of chemistry, for the students themselves, for the Institute, and for the profession generally. He believed that the association would lead chemists to a more self-confident expression of their views in public debate and would bring to the fore men and women who, in the course of years, would prove leaders of the profession.

The meeting closed with a vote of thanks to Mr. Pilcher and to the chairman.

The Indigo Situation in India

Results of Research Work at Pusa and Bihar

At a meeting of the Indian Section of the Royal Society of Arts, held at John Street, Adelphi, London, on March 24, Sir Thomas Holland presiding, Professor H. E. Armstrong read a paper on "The Indigo Situation in India."

Professor Armstrong said that from time immemorial it had been the practice to grow a leguminous crop in alternation with a cereal or other non-leguminous plant. We had learnt quite recently to appreciate the special value of the first mentioned crop as a means of bringing down nitrogen from the heavens into the earth; in addition the leguminous plant had a peculiar value as an organic manure. The dyestuff, indigo, was therefore, little more than a by-product, the plant itself having a high agricultural value.

It was desirable, he said, to correct a misapprehension which seemed to be current that Mr. Davis was first appointed for one year to develop the manufacture of an indigo paste which could be exported from India, and that he was only then appointed for a further period of five years to study indigo problems generally. As he (Professor Armstrong) was directly responsible for the appointment of Mr. Davis he was able to place the facts on record. When he recommended Mr. Davis he was pressed to make the appointment for five years, but he had insisted that it should be for a single probationary year. When in Calcutta in 1914 he had pointed out that it should be possible to effect improvements, especially in agricultural practice, in the plant itself and in the process of manufacture. The problem as a whole was put in the hands of Mr. Davis, but he was advised in the first instance to prepare a paste comparable in form with that in which the Germans had put synthetic indigotin upon the market—i.e., in a paste containing as nearly as possible 20 per cent. of indigotin. Incidentally he would emphasise the fact that the Germans had never made indigo.

Success of Artificial Madder

The immense success of artificial madder was due almost entirely to the fact that it was supplied as a paste of definite strength; the same policy was at the root of the success of synthetic indigotin. He believed that had the planters, when competition began, put indigo on the market as a paste of standard strength, their industry would not have been ruined. Continuing, Professor Armstrong said he could not help thinking that it should be possible to secure a fair share of the trade for natural indigo in competition with the synthetic article. He was, in fact, prepared definitely to affirm his belief in a secure future for indigo. Not only had it a markedly higher value as a dyestuff than indigotin pure and simple, but it might well happen that not a few natural dyestuffs might once more be in demand on account of the difficulty of obtaining raw material for the manufacture of artificial substitutes.

Natural Indigo Paste

Two of the chief advantages which had always been claimed for synthetic indigotin as against natural indigo were uniformity of colour and strength, and fineness of division. Makers had been accustomed to supply the synthetic product in paste form containing 20 per cent. of dry indigotin; in this paste the pigment was in such a finely divided state that no mechanical preparation was necessary to make it ready for dyeing or printing. Natural indigo might contain any proportion up to 75 per cent. of indigotin and must be subjected to a long and troublesome grinding process to render it fit for the dye vat. Most dyers were glad to be relieved of this burden, and he had heard that Germany had accelerated the abandonment by buying up the machinery.

On his arrival in India, Mr. Davis had no particular difficulty in removing water from precipitated indigo to the extent required to give a paste with approximately 20 per cent. of indigotin, leaving indigo brown out of account. He was able to keep this from changing even under Indian conditions, provided the paste were exposed to air; but on closing the packages anaerobic organisms became active. It seemed, however, that even these could be kept under by an increased dose of alkali. Several casks of this paste were sent to England, and analyses showed the paste to be a unit or so below the 20 per cent. strength. The results returned by the different analysts were discrepant, and it was clear, said the lecturer, that the methods of analysis commonly practised were in need of

careful revision. The paste was then submitted to several competent dyers and was declared to be excellent. Satisfactory as this trial was it was obviously uneconomic to send a paste, mainly water, all the way from India to this country; the war made it practically impossible to procure casks or suitable packages for its carriage, and later even dry indigo could rarely be shipped.

Work in England

It was therefore decided to continue the inquiry over here, and to endeavour to make a paste from dry indigo. Mr. Reginald Brown was induced to undertake the task, and he furnished proof that a paste prepared from the natural material was superior to synthetic indigotin for most dyeing purposes. It was only within the last three years, however, that the process had become a commercial success. The lecturer ascribed this superiority to the specific effect of indigo brown in the dye vat. When the problem was taken up in earnest the two chief difficulties encountered were in the selection of a suitable mechanical means of mixing and grinding and the preservation of the resettling paste. Eventually it was found possible, by successive treatment in grinding machines of two different types (both previously used solely for pigment colours), in the course of two or three hours to convert even the hardest varieties of natural indigo into a paste indistinguishable in fineness from synthetic indigotin, and satisfying in this respect the most exacting demands of the dyer and calico printer.

Comparative reduction trials in hydrosulphate vats and also in zinc-lined vats proved that the rate and completeness of reduction, which depended upon the state of division of the colouring matter, were alike both in the natural and in the synthetic indigotin pastes.

Bacterial Action in the Paste

To ensure that the paste would keep had been more difficult. The danger from bacterial action was very slight at temperatures below 60°F., but trouble was experienced at British summer temperatures unless prevented by a suitable addition to the paste. The usual antiseptics were ruled out, as their presence might interfere with the course of useful processes in the "woad vat" or other fermentation vats. In this connexion the lecturer remarked that it had not been definitely established that this interference actually did take place. In paste destined for use in the hydrosulphite or zinc lime vat there was no objection to the presence of phenol or formaldehydes.

From the trials made with a large number of substances, at a range of temperatures varying from 60° to 120°F., it appeared that a small addition of paranitraniline (0.05 per cent. of the weight of the paste) retarded bacterial change almost entirely, and was without interference in the dyeing process. Natural indigo paste containing this addition could be stored many months in temperate climates without fear of deterioration. In hot countries the presence of paranitraniline was insufficient to prevent decomposition; evidently some highly resistant organisms were not destroyed by it.

Experiments were at present in progress with the object of adapting to the commercial scale another sterilisation method which had proved effective in the laboratory.

Consumption of Natural Indigo

Dealing with the consumption of natural indigo paste in this country, Professor Armstrong said it found a ready sale, the quantity in use being limited by the ability of the planters to furnish it at a price which would place it in competition with synthetic indigotin. In regard to the dyeing properties of the natural paste the lecturer said it was certainly superior to the synthetic article, although he should add that synthetic indigotin was better for light shades, especially in printing discharge patterns on calico, as the whites were left clear and bright. In his preliminary experiments Mr. Davis had found it was possible to air-dry indigo to an easily pulverulent form, in which it required practically no grinding. He believed this would ultimately prove to be a form likely to satisfy all requirements.

Dealing with the evidence as to the effect of manurial treatment on the yield and quality of the plant Professor Armstrong, referred at some length to a series of systematic trials which

were begun at Pusa in 1917; tables were given showing the results achieved on twelve experimental plots. From the analyses of many hundreds of samples of Java indigo leaf Mr. Davis had found that at Pusa the potential indigotin varied usually between 0.4 and 0.6 per cent.; values as high as 0.7 per cent. were unusual and he had never before found values so high as those obtained in these trials—from 0.8 to nearly 1 per cent.

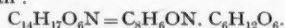
The yield of indigo in the Pusa trials, continued the lecturer, was inversely proportional to the amount of nitrogen in the soils. The lesson to be derived from the various experiments was that it was necessary to ensure three things in order to secure the maximum quantity of a high quality plant: (1) A low proportion of readily available nitrogen in the soil; (2) a good supply of organic matter to furnish the necessary carbohydrate nutriment on which the development of the nodular growths on the roots largely depended; and (3) a good supply of soluble phosphate. Mr. Davis was of the opinion that when wheat was grown with the indigo plant, the proportion of indican in the leaf was thereby materially increased, possibly to the extent of 50 per cent.; the effect was due to the withdrawal of readily available nitrogen from the soil by the wheat, so that the nodules on the roots of the indigo plants were consequently forced more into action than would be the case if the plant had a larger store of combined nitrogen at its disposal. A supply of soluble phosphate was all important, in Bihar especially. It had yet to be ascertained whether the indigo plant could be grown without nodules, and if so whether indican could be formed at all under this condition. In this connexion Professor Armstrong said that the formation of indican might be more a matter of the production of indoxyl than of the existence of a special mechanism (enzyme) in the plant which was able to couple the indoxyl with glucose. It was noteworthy that indigo could be obtained from non-leguminous plants, e.g. woad.

Experiments in Assam

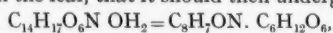
Alluding to the migrant character of the indigo industry, the lecturer referred to recent indigo growing experiments in Assam where the plant was grown on newly cleared tea land and between the rows of young tea bushes. Trials made at Panchnoi by Mr. Leonard West had shown that it was possible to obtain both a high yield and a superlative quality of plant; unfortunately the disastrous state of the tea trade had prevented development. In Bihar at present the average yield of the Java plant was from 50 to 70 maunds per acre and the plant was of poor quality, having only 40 to 45 per cent. of leaf containing about 0.6 per cent. of potential indigotin. The cost of producing indigo necessarily depended on the yield per acre, and it would not pay to grow it unless better returns were obtained. The primary need of Bihar was an improvement in the growth of the plant if the competition of synthetic indigotin was to be withstood.

Indigo from the Java Plant

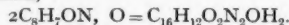
Dealing with the manufacture of indigo from the Java plant Professor Armstrong referred to the value of the progress made at Pusa by Mr. Davis and his collaborator, Mr. C. M. Hutchinson. Despite much work by previous observers, he said, practically nothing was known of the exact course of the process of extraction. The dyestuff was not an immediate natural product. Its precursor in the leaf was the simpler substance indoxyl (C_8H_7ON) which was present in combination with the sugar glucose ($C_6H_{12}O_6$) as the easily soluble glucoside indican:



To produce indigo it was necessary that the indican should be extracted from the leaf, that it should then undergo hydrolysis,



and that the indoxyl then obtained should be converted into indigo by oxidation,



The plant is cut at daylight and is carried quickly in carts to the factory where it is packed in large cement-lined tanks; when the charging is complete and weighted boards have been placed on the charge, water is run in. After several hours' steeping the extract is run off into testing tanks, where the liquid is brought into contact with air and the indigo precipitated. When the maximum of liquid has been run off the sludge is removed to filters and then to presses, and finally the press cakes are dried in the air. Of the problems awaiting solution the chief were the nature of the process by which the leaf was rendered permeable so that water could enter and

indican pass out into the solution; and the process by which the hydrolysis was effected. A natural leaf was impervious. At the outset, said the lecturer, a more or less vigorous bacterial fermentation was set up in the tank, doubtless at the expense of sugary materials exuded from the cut ends of the plant stalk and bruised leaves. The water used in Bihar was usually hard and alkaline. During the first three or four hours little, if any, indican was extracted; then, as the solution became acid, and acidity increased, more and more passed out and was usually hydrolysed forthwith. At Bihar the best results were obtained by stopping the steeping process after about twelve hours; if continued beyond the optimum period destructive changes rapidly set in which involved a loss of indigo and an increase of impurities in the product.

Action of Carbonic Acid

It would not have been surprising, continued Professor Armstrong, had it been found that organic acids were formed by fermentative action during the earlier period. This was proved not to be the case; the development and increase of acidity was mainly due to carbonic acid. As this acid, by itself, acted but slowly on the leaves—although it ultimately rendered them permeable—it was probable that the change at the surface was due rather to a combination of circumstances leading to the death of the leaf and the onset of internal changes which led to complete degradation of the vital mechanism. Not only was carbonic acid formed, but oxygen disappeared from the solution, the leaves were in the dark and immersed in water—all unnatural conditions; notwithstanding its weakness it was clear that carbonic acid played an extraordinary part in the process generally, the quality of indigo produced being the worse, the more freely carbonic acid was formed.

Previous workers had inclined to the belief that the indican was converted into indoxyl and glucose by the agency of an enzyme present in the leaf. Messrs. Davis and Hutchinson, however, had brought forward a body of evidence from which it was clear that organisms played a preponderating part. Mr. Davis was even of the opinion that the enzymic actions within the leaf were rather to be avoided as they led to undesirable results.

Indoxyl, said Professor Armstrong, was one of the most sensitive substances known to chemists. It might exist in solution in two interconvertible forms, in proportions which varied probably with the temperature and the effective alkalinity or acidity of the liquid; these might be differently affected by organisms and on oxidation. Carbonic acid might have an influence either by retarding or promoting the action of this on the organism. Perhaps its main deleterious action was the solvent action it exercised upon proteinaceous substances present in the leaf which were subsequently precipitated during the beating process together with the indigo, thus reducing its purity. The so-called indigo-gluten, soluble in dilute acids, which might form 20 per cent. or more of the crude indigo, was formed in this way.

In conclusion Professor Armstrong said the object of his paper had been to make clear the immensity and importance of the problems awaiting solution by agriculturists, especially in connexion with leguminous crops. To interrupt Mr. Davis's investigation at its present stage was an act nothing short of madness.

A discussion followed in which the chairman, Dr. J. A. Voelcker, Mr. G. W. Watson, Mr. R. Bridgett, Sir Lancelot Hare, and Mr. D. T. Chadwick, took part, and to which Professor Armstrong replied.

Fusibility of Coal Ash

A THOROUGH survey of the fusibility of coal ash from various coals of the United States has been completed by the U.S.A. Bureau of Mines and the data tabulated for publication as a Bureau bulletin. The method for fusibility of coal ash, as developed by the Bureau, has been adopted as a tentative standard method by the American Society for Testing Materials. An alternate rapid method known as the micromeldometer method has been proposed. The Bureau has assembled the equipment for this alternate method, and in co-operation with a number of other laboratories a series of tests comparing the two methods is being made. In co-operation with the fuel section of the Bureau, it is proposed to investigate the relation of laboratory fusibility tests to clinker formation in burning coal under actual operating conditions.

Chemical Aspects of Cement

The Utilisation of Blast Furnace Slag

At a meeting of the Newcastle-on-Tyne Section of the Society of Chemical Industry on March 24 Dr. C. H. Desch gave his concluding lecture on "Cement." Reverting to the subject of catalysts and their action on cement, Dr. Desch said he had been forced in his last lecture to omit mention of one substance which was being strongly recommended. Whilst calcium sulphate, as a rule, retarded the setting of cement calcium chloride, on the other hand, was one of the accelerating salts. Experiments in America had showed it gave a more rapid hardening, and it was not so much an acceleration of the initial set only—though that did happen—but it accelerated the process of hardening. There were, however, some objections attached to the addition of calcium chloride, as it was a deliquescent salt, and calcium oxychloride, which was recommended by the American Bureau of Standards, had been introduced. By mixing lime and chloride one got oxychloride forming the formula 3CaO , CaCl_2 , $14-16 \text{H}_2\text{O}$. That compound was a crystalline material and not deliquescent. So far as he knew it had not been proved that it gave a greater permanent strength, but in the first few weeks it had given a greater degree of hardness. Generally speaking, he thought that the action of catalysts on cements should be more closely studied. He proposed to pass on from the Portland cements strictly called by that name to other varieties being made and experimented with at the present time. Commencing with the so-called iron ore cement, he said that one great defect to which cements were liable was disintegration by the action of sea water, and much research work had taken place with a view to improving the efficiency of cement for marine purposes. One form of German cement was made by adding a certain amount of iron ore (ferric oxide), which to a large extent replaced the alumina. This had the effect of giving the material an extraordinary resistance to sea water. The disadvantages included a decided difficulty in working the material, as it was not so plastic and hardened very slowly. Another variety of cement was made from magnesite. If magnesite were prepared from magnesite by heating at a temperature not above 1100° , and then mixed with finely-divided silica or a substance with silica in active form it would react with water and gradually harden, due to the formation of the compound 2MgO , SiO_2 . It did not give the strength of Portland cement, but it could be utilised and hardened fairly well. Portland cements were manufactured at high temperatures so that any magnesite which might be in them was converted into the dead burnt form which only hydrated slowly, and it might set long after the cement had set. A high magnesite in a Portland cement had a great tendency, therefore, to cause expansion. If ignited at about 1100° it would hydrate completely in a short time; if at 1200° it would take much longer, and at 1450° it was found to have hydrated 70 per cent. after six years, so that in any magnesite cements that were made it was essential that the oxide should be obtained at quite a low temperature:

Addition of Pozzolana Materials

More important than those cements, however, were those made by the addition of the pozzolana materials. As he had explained in his opening lecture, the original pozzolana materials were of volcanic origin, but other materials had been used as substitutes. The essential feature of pozzolana materials was that they should contain silica and alumina in active form. The practice had been recommended of adding trass or similar material to cement, and that, he believed, was a good practice. The trass should contain a proportion of active silica, one should be certain that it was a real pozzolanic material and that the silicate was in a really active form. The pozzolanic material, which should be ground quite as finely as the cement itself, would greatly reduce the action of sea water and other corroding agents on the cement. In any work to be exposed to the action of sea water or sewage, the addition of pozzolanic material was distinctly an advantage in producing greater resistancy.

Passing to cements closely related to pozzolanic cements, the lecturer referred to the use of blast furnace slag. It had long appeared to chemists that blast furnace slag, being a material similar in composition to Portland cement, should be of use as a cement. They varied a good deal in composition, but they consisted essentially of lime, silica, and alumina, though not having the same properties as Portland cement. If ordinary blast furnace slag were examined it would be

found that some of them remained as stony masses, with little change when exposed to air, and others crumbled to powder when exposed to air, the latter effect being most pronounced with slags from electric furnaces. That effect had nothing to do with moisture but with the presence of the 2CaO , SiO_2 which existed there in a polymorphous form. Blast furnace slag was usually poor in lime and high in alumina. The slag itself should not be considered as a cement of great value, though it did give some very good results. There was, however, a material in use called slag cement, which was made by granulating the slag, grinding it very finely, and then mixing it with a suitable proportion of hydrated lime. That was mixed with the granulated slag until the proportion of lime was brought from 45 to 50 per cent. to 60 or 62 per cent. to make it like Portland cement. It was commonly known as slag cement and often proved a very good material. Well-made Portland cement did not contain free lime until after mixing with water, but in the case of slag cement there was a considerable proportion of free lime and the important constituent of Portland cement, tri-calcium silicate, was entirely absent. Evidently the setting of that slag cement would not be the same as Portland cement because of the quantity of free lime, which would behave as lime in ordinary lime mortar, and the setting properties of the remainder would not be the same but rather like the setting properties of the inferior part of Portland cement.

Effect of Calcium Sulphide

The main objection to slag cements had been the presence of the sulphide to which he had referred. It had been suggested that the calcium sulphide might oxidise, and so form calcium sulphate, which would cause expansion. There was also the suggestion that when the cement was used in reinforced concrete that the presence of the sulphides might lead to rusting of the steel. There was a widespread belief that calcium sulphide was a very harmful material. From experiments which he had made he was of the opinion that calcium sulphide was not a harmful material. He thought, however, that if any of the sulphur combined with the iron they might get very harmful results. Slag cements were apt to have ferrous sulphide present, and when that occurred it might be rather disastrous. The bad behaviour of the sulphur was largely derived from the behaviour of concrete made with the aggregate containing sulphur such as coke breeze. In such a case, a year or two after being made, the whole mass might swell up by enormous expansion, and that could be traced to the presence of sulphides, but those were in the aggregate and not in the cement. Slag cements might, and often did, give as good tensile tests as Portland cements, but they gave much more inferior compression tests. Another difference was that whilst those cements hardened well under water they did not give the same strength when hardened in air, and for dry work they did not give such good results as Portland cement.

Many methods of utilising blast furnace slag had been tried. One way was to add the proper quantity of lime, and then pass through a rotary kiln just as if starting with lime and clay. When made in that way it was really a Portland cement, and fulfilled the conditions of the specifications. That was a relatively costly way, and ironmasters were chary of undertaking it, though it was done in America. Another way was to mix a finely-granulated slag with a Portland cement. That gave greatly increased strength and greater resistance to sea water, and had led to the production of what was known as iron Portland cement in Germany. It consisted of Portland cement clinker to which had been added a certain proportion of ground granulated slag. In Germany the specification limited it to 30 per cent. of slag and 70 per cent. of clinker. That was sold as iron Portland cement, and had all the properties of Portland cement plus the properties of the pozzolanic materials, which gave greater resistance. The question of a standard specification for cements made from blast furnace slag was now under consideration. The characteristic of the slag cements was that they stood sea water very well and a peculiarity was that calcium sulphate instead of slowing down the setting as in the case of Portland cements, accelerated it, and by small additions one could vary the setting time within very wide limits. In conclusion, Dr. Desch said there was a great field for research in cements. They were used in millions of tons in all forms of engineering, and it was most desirable that more work should be carried on in research. Given that research work, he thought they would arrive at a product which would satisfy the most exacting requirements.

The Properties of Powders

Where Fine Grinding is Necessary

THE adjourned discussion on "The Properties of Powders" by the Faraday Society and the Oil and Colour Chemists' Association was held at the rooms of the Chemical Society, London, on March 23. Professor A. W. Porter, F.R.S., President of the Faraday Society, was in the chair.

MR. C. A. KLEIN, who opened the adjourned discussion, said there were many industries in which so-called fine grinding was essential, and Col. Ramsden had described one test, viz., a man's face, but that was not the test adopted in colour works, for obvious reasons. Nevertheless, the method used was probably just as inaccurate, provided the material was not poisonous; it was frequently tested between the teeth or two finger-nails. Really accurate methods were seldom in vogue. The fetish in many industries was that materials should be finely ground, because that cost more money, but in some industries grinding beyond a certain stage might be detrimental. There had been many instruments devised, and he personally preferred the Schone elutriator because he had got the best results with it. He did not know whether Dr. Lowry came across flocculation in the particles he had; they were rather large, and when dealing with smaller particles the trouble with flocculation was considerable, and in expressing results he felt that they ought to make it clear how they got these results. Flocculation could be prevented, and the same applied to conglomeration. A matter he wished to lay great stress on was the influence of shape as affecting the speed of elutriation.

The Lowry Elutriator

DR. T. M. LOWRY said the chief drawback to the use of the elutriator as a means of controlling the efficiency of a grinding-plant arose from the fact that at the end of the elutriation it was necessary to take out and weigh the minute residue of coarse material remaining in the elutriator. This was a very simple operation, but necessitated the use of a Gooch crucible, a filter pump and an analytical balance. The practical effect was to restrict this method of testing to grinding-plants where a chemist, or a manager with some chemical training, was available. In the new form of Lowry elutriator this difficulty was avoided by making use of a volumetric instead of a gravimetric estimate of the residue. The apparatus was based on Boswell's elutriator, and was modified only in two respects: (i) the lower portion of the vertical tube was tapered smoothly from 25 to 2 mm., and was then sealed on to a 2 mm. capillary having a length of about 100 mm.; (ii) this capillary carried a tap instead of a screw-clip.

Separating by Levigation

MR. W. J. PALMER said the question of grinding was a matter of very great importance in the paint-making industry. He knew from personal experience many years ago, when there were no elutriators, the importance of grinding. He devised a method of separating certain grades of different pigments by a process more of levigation than elutriation; it was not fine enough to be called elutriation, and it was found that the difficulties from the hard setting of paints in cans sent abroad could be traced to the size of the particle. In the manufacture of enamel paints, lead oxide was almost exclusively used as the pigment, and it had been found that what was now called the colloidal suspension of the zinc oxide in the medium could be directly traced back to the size of the particles of zinc oxide.

DR. R. LESSING said he had been interested in elutriation for a considerable number of years, and had placed before the Society on one occasion a rough and ready elutriator method for separating unfired clay from fired clay in firebrick manufacture. The difference in the size of the particles, compared with the paint industry, was very great, and the object was to get the large fireclay particles separated from the green in order to determine the proper proportion of mixture. There was one very far-reaching application of the principles underlying elutriation which ought to be considered, although it had not, so far, received much attention, and that was in the coal industry. Another instance in which the advantage of elutriation methods had been recognised was in the enormous number of washing processes in metallurgical operations in connexion with natural products. In the South African gold industry there was a very practical problem, the cyanide process being practically elutriation on a large scale.

MR. J. H. TATE said the question of elutriation was very interesting in connexion with the presence of cocoa shell in cocoa. The problem was more complicated because there

were two substances, the cocoa and the shell, but a great deal more work would have to be done before they could publish the results. He believed that eventually they would find that elutriation would give the most rapid and reliable method.

Sedimentation Methods

MR. KEEN said he would like to know why elutriation methods should be used in preference to sedimentation, because it seemed to him that sedimentation was the simplest.

MR. NOEL HEATON said that he had a good deal of experience in grinding materials in ball mills, more particularly glass powders, and the result mentioned by Mr. Klein, viz., that the ball mill tended to make the particles spherical, did not in fact take place. The particles, when examined under a microscope, were the characteristic angular particles of broken glass that were obtained in the first place, and there was no rounding effect whatever.

MR. HOLMAN, dealing with the elutriation of extremely small particles, said there was a recent paper by the Tin and Tungsten Research Committee on the overflow slimes which threw some light on the subject. The great trouble with tin was that there is an unaccountable loss of 10 to 15 per cent. no matter what machinery was used, and that was traced to the fact that in the mode of occurrence, tin was in extremely fine particles and the elutriator had been useful in this work, instead of the screen previously used. It seemed to him that a lot of stress was laid, in paint manufacture, by some people on the necessity for the very fine particle without sufficient being known of the mixing of the paint.

Several other papers were taken as read in the absence of the authors, and the President wound up the discussion with a few remarks. He expressed surprise that no reference had been made to the centrifuge. He had always been accustomed to separate powders by that method, and the question was whether that was the easiest of the processes that were available. By judicious centrifuging, it was possible to separate out almost any size particle desired, but it required several operations to effect a separation of that kind.

The Newspaper Press Fund

MR. ERNEST J. P. BENN, one of the stewards at the annual dinner of the Newspaper Press Fund, has issued a statement to the Trade and Technical Press, in which he says that the announcement that Lord Leverhulme is to preside at the fifty-ninth annual dinner, on April 27, draws attention to an organisation of which the outside world knows but little. By the very conditions of his occupation the journalist is, for the most part, anonymous. Consequently, dependent though we all are upon him for news of the happenings of the day, it is inevitable that, if in the stress and competition of modern life he "goes under," very few beyond his immediate circle and those dependent on him are aware of his distress. It was to help the journalist who has fallen on evil days, and the widow and children he may leave behind him unprovided for, that the Newspaper Press Fund was founded in 1864, and for nearly sixty years it has done splendid work in relieving sickness and want among the journalistic profession. Last year, owing to the general depression, the claims were exceptionally heavy, and the fund distributed in grants and pensions the record sum of over £10,000. The regular income of the Fund, from members' subscriptions and interest on investments, covers less than half this sum, and if it is to meet the calls upon it, to say nothing of extending its beneficent operations, a large amount of money has to be found from outside sources every year. It is undoubtedly merely lack of knowledge which has prevented the public in the past from coming more generously to the support of the men who not only in their ordinary vocation render valuable service alike to the business and the social world, but who are themselves always amongst the first to give their services freely in any worthy charitable cause. Cheques should be made payable to The Secretary, Newspaper Press Fund, 11, Garrick Street, London, W.C. 2.

Dr. Paterson's New Appointment

DR. J. H. PATERSON, president of the Newcastle-on-Tyne Section of the Society of Chemical Industry who was for many years with Swan, Hunter & Wigham Richardson, is about to leave the city to take up an appointment in London. Dr. Paterson is an authority on electric welding in all its branches.

Constituents of Essential Oils

Research on Straight Chain Compounds

ALTHOUGH the principal object of the second Cantor lecture on the "Constituents of Essential Oils" at the Royal Society of Arts on Monday by Mr. Guy Radcliffe was to give an account of the terpenes which enter so largely into this subject, it is not at all certain that the audience was not most interested in his discursive comments on what may be termed the commercial side of the industry. Much of the technical information given was admittedly of a more or less well-known character, as is usually the case in a lecture which can only last an hour, but fuller details will be given when the lectures come to be printed. As it was, Mr. Radcliffe found time to give a lot of information on the purely technical side and explained the main ingredients of essential oils, the principal being the terpenes which in themselves are subdivided into four groups, viz., the hemiterpenes, the terpenes proper, the sesquiterpenes and the polyterpenes, the terpenes proper receiving most attention as being the most important from the point of view of the essential oil chemist. Next came the sesquiterpenes; the others were not of great importance. Another hydrocarbon of considerable importance was normal heptane. The significance of the open chain and the ring structure was dealt with briefly and a plea put in for a closer study of the ring compounds by starting, not with CH_4 , as everybody did, but with, for example, C_6H_6 . Looked at from this point of view, Mr. Radcliffe suggested that we know very little even about the terpenes at the present time.

Leaving this side of the subject, from time to time during the course of the lecture, Mr. Radcliffe dealt with the general position of the essential oil industry in this country and referred to one or two notable achievements. In particular he emphasised the importance of not ignoring the significance of small traces of various substances because it was very often these small traces which had the distinctive odour and made all the difference between the properly mixed essential oil and the imperfectly mixed, and, consequently, to the selling price.

There was need for remembering that the straight chain compounds were of immense importance, as they were extremely sensitive to chemical change, and it was possible to make them act very much after the fashion of ring compounds if only they were investigated from points of view different from those usually adopted. There was a large field for research in this direction alone. As to the things that had been done by the industry already, special attention was called to the alpha and beta ionones prepared by Crosfield's and to the cresinols prepared and placed on the market by British Drug Houses, Ltd., through the work of Messrs. Cocking & Carr, whom he wished to congratulate; this latter was a distinct novelty and there were not many novelties to be found in the perfume industry to-day. There were many things not made here which could be, and would be made, but they were not novelties. Samples of oils by Boake, Roberts, & Co., Stafford Allen & Co., and W. J. Bush & Co. were exhibited.

Brief reference was made to the essential oils which, when evaporated, leave behind wax-like solids belonging to the hydrocarbon waxes. The aliphatic or olefinic terpenes were described, their characteristic being that their carbon atoms are arranged in chains instead of rings. An account was also given of the terpenes proper and of the various ways in which the individual members can be recognised. The use made of the esters of borneol and menthol for medicinal purposes was next referred to, although the lecturer admitted that he was not aware that any firm in this country was producing from borneol some of the things which were forced upon this country by German firms before the war.

Death of Professor W. B. Bottomley

THE death took place at Huddersfield, on March 24, of Mr. William Beechcroft Bottomley, lately Professor of Botany at King's College, London. Born in 1864, Professor Bottomley took a great interest in agricultural research, having devoted much time to the study of the use of "bacterised" peat as a fertiliser. With a view to increasing the productivity of the soil, he investigated nitrogen-fixing organisms which would enable plants to obtain nitrogen from the air by means of bacteria. He subjected peat to a process of decomposition and found that other bacteria were produced which led to the growth of nitrogen-fixing organisms.

Society of Chemical Industry

Annual Dinner of the Newcastle Section

MR. E. V. EVANS, the hon. treasurer of the Society of Chemical Industry, was the chief guest at the annual dinner of the Newcastle Section on March 23. The gathering took place in the Refectory of Armstrong College, and Dr. J. H. Paterson presided. There was a representative gathering of members and amongst the guests were Colonel F. Simpson, President of the Institute of Mining and Electrical Engineers; Mr. C. C. Leach, President of the North of England Institute of Mining and Mechanical Engineers; and Mr. E. W. Fraser Smith, secretary of the North East Coast Institution of Engineers and Shipbuilders.

Mr. Fraser Smith proposed the toast of the Society, coupling it with the name of Mr. Evans. Mr. Smith said that in his opinion many technical societies were as important a factor in the education of the community as were technical colleges. The average man did not realise the great usefulness to the whole community of the technical societies of the country. Speaking of the treasurer he said that his work was known beyond the Society itself, and the research work he had conducted in connexion with fuel was most valuable.

Mr. Evans, replying, paid a tribute to the work of the Newcastle Section in building up the Society. Both by the work of the members from Newcastle on the Council and by the quality of the papers published in the transactions, Newcastle could claim to be one of the most important sections in the country. The present financial position of the Society was much sounder than a few years ago, and that was largely if not entirely due to the work of their ex-president, Professor Louis. By the institution of the Finance Committee he had rendered most valuable assistance to the Society.

Col. F. R. Simpson, in proposing the toast of the local Section, coupled with it the name of the chairman, Dr. J. H. Paterson. He regretted with them that Dr. Paterson was likely to leave them shortly as it would be a loss to the Section. He had been very interested in the activities of the Section, and perhaps it was on the analysis of coal that he came nearest to them in his work. Speaking as coalowner he was bound to say that he found analyses of coal were very funny things. The coal industry, the electrical industry and, indeed all industries, were finding themselves more and more dependent upon the work of the chemist. They literally could not get on without the chemist. At most collieries now they kept a "tame" chemist. There was little doubt either that he was exceedingly valuable to them.

Dr. J. H. Paterson, responding to the toast, referred to Col. Simpson's allusions to the "tame" chemist; that was the last thing he should be. Continuing, Dr. Paterson made an allusion to his impending departure from Newcastle, but assured them he had no intention of severing his connexion with the Section—in fact he was coming to Newcastle so often that he would remain a member and join both sections if necessary. He made a special reference to the excellent work and progress of the Chemical Club in Newcastle, and said he hoped it was but a beginning of the spread of the movement to establish technical clubs. He looked forward to the day when Newcastle would boast of one roof housing all the technical societies and providing ample space for technical and social gatherings.

Sunderland Chemical Works Fatality

AT Sunderland on March 24 an inquest was held on the bodies of Messrs. T. H. Dougherty and G. Rogers, who were fatally gassed by fumes in a tar still at the Sunderland Works of Brotherton & Co., Ltd. In evidence it was stated that elaborate regulations for the safety of the workpeople were drawn up and were prominently displayed in the works. The still had not been in use since March 9, when it was stopped for cleaning purposes. It was cleaned and ready for use when the accident occurred. After paying a tribute to the heroism of Mr. Rogers and the courage displayed by others in attempting to rescue the men, the coroner entered a verdict of "Accidental Death" in each case. It was, he said, very unfortunate that rules and regulations made voluntarily by the firm for the safety of their workmen should be disregarded, as they evidently had been in this case.

On behalf of Sir Edward Brotherton, chairman of the company, Mr. Charles Ratcliffe, managing director, expressed deep regret at the accident and sympathy with the relations of the deceased.

Dye Manufacturers' Action

Breach of Contract Claim Adjourned

At the West Riding Assizes in Leeds, on March 22, Mr. Justice Bray commenced the hearing of an action brought by L. B. Holliday & Co., Ltd., dye manufacturers, Huddersfield, for damages against Mr. Clement Whitehead and against J. B. and W. R. Sharp, Ltd., dye manufacturers, of Lumb Works, Edenfield, Lancashire.

Mr. C. F. Lowenthal, for the plaintiffs, said Mr. Whitehead was a chemist formerly in the employment of the plaintiffs. As against him the action was for breach of his contract of employment. He had, however, failed to make discovery in the action and an order had been made in another court striking out his defence and directing him to be in the same position as if he had not defended the action. The case outlined by Mr. Lowenthal was that there had been breach of an agreement of January 26, 1920, by which the defendant, Mr. Whitehead, was engaged by Holliday & Co. as a whole-time chemist for a period of five years, and which provided that he should not divulge any of the plaintiffs' trade secrets. He left the plaintiffs' employment in June, 1920, and entered the employ of the defendant firm, taking with him the formulae for the manufacture of three dyes—chrome violet, paramine yellow, and diazamine fast yellow—which were secrets that the defendant Whitehead was required to keep, and were formulae respectively of the value of at least £1,000, £500, and £500. It was claimed that if, as was alleged, the defendant firm engaged Whitehead with the full knowledge that he was employed as a chemist by the plaintiffs, and obtained possession of the formulae, the plaintiffs were entitled to damages for breach of agreement and for monetary loss caused by deprivation of the formulae; to the return of the formulae or their value; to the payment of any sums received for dyes made according to the formulae; and to an injunction restraining the defendants from making use of the formulae. The case against J. B. & W. R. Sharp, Ltd., counsel added, was that knowing that Whitehead was in the employment of the plaintiffs, they engaged him. Counsel asked his Lordship to come to the conclusion that they shut their eyes to the truth with a view to getting hold of him and that after they had received notice from the plaintiffs of the existing agreement they continued to employ him.

The defence of Mr. Whitehead was that the agreement was dissolved verbally by mutual consent, and he did not admit that the plaintiffs entrusted him with any formulae, while Messrs. Sharp disclaimed knowledge of any agreement or of the defendant Whitehead's possession of any secret formulae belonging to the plaintiffs. Mr. Lowenthal contended, however, that his case was supported by correspondence which had passed.

The hearing was adjourned.

The Purity of Caustic Potash

Alleged Breach of Contract Claim

In the Scottish Court of Session, on March 23, before Lord Justice Clerk and Lords Salveson and Ormsdale, a reclaiming note was applied for in an action in which Campbell & Co., soap manufacturers, 360, Gallowgate, Glasgow, sued Ferguson, Shaw & Sons, soap manufacturers, Imperial Oil Works, Scott Street, Glasgow, for £368 5s. 9d. as damages for alleged breach of contract. In October, 1919, as an obligation, the defenders supplied the pursuers with a drum of caustic potash, weighing 6 cwt., for the manufacture of a neutral soft soap. The price was £54 1s. 6d. The pursuers used it in the usual way, but found it impossible to make soap with it, and when they had the lye analysed they found that it was not pure caustic potash, but that it contained quantities of carbonate of potash, chloride of potassium, and hydrate of soda, and was therefore practically useless for the manufacture of soap. They therefore maintained that the defenders were in breach of contract, and in the sum sued for claimed to be compensated for the materials, &c., wasted.

The defenders denied breach of contract, and said they did not guarantee the caustic potash as 100 per cent. caustic potash, or as in any way being pure. They sold it as pure, but said this description meant "commercially pure." In the case of caustic potash sold in October, 1919, it was "commercially pure" if it contained 88 per cent. caustic potash. They also submitted that, in so far as the impurities shown by analysis to be contained in the solution were in

excess of what characterised caustic potash which was commercially pure, these must be attributed to carelessness on the part of the pursuers themselves in the treatment of the solution in their own premises. It appeared that the defenders had purchased fifteen drums of caustic potash from the Government agency in this country which was at that time distributing chemicals from Germany. Of these they used fourteen in their own works, and gave one to the pursuers. The contents of the drums made good soap, although it was not the same kind of soap as the pursuers proposed to make, while analysis of the contents of one of the fourteen drums showed it to be commercially pure caustic potash. At the time there were general complaints about the quality of the German manufactured chemicals.

In the Outer House the Lord Ordinary assailed the defenders, and found them entitled to expenses, holding that the pursuers had not proved disconformity to contract.

The Division recalled the Lord Ordinary's interlocutor, and found the pursuer entitled to £75 of damages. Their Lordships held that it was proved that while the defenders had supplied the drum to the pursuers exactly as received, there had been breach of contract in the sense that while the defenders were themselves quite blameless they in point of fact supplied caustic potash which was only 70 per cent. pure, and therefore not up to contract. Their Lordships further held that the amount of the pursuers' claim for damages was extravagant, and to give effect to their disapproval of the claim as stated, modified the expenses awarded to the pursuers in the Outer House to two-thirds. The pursuers were allowed the expenses of the reclaiming note.

Sequel to Deals in Oxalic Acid

At the London Bankruptcy Court, on March 24, Mr. Pierre Marcotty, chemical merchant, late of 129, Cannon Street, London, attended for his public examination before Mr. Registrar Francke on a statement of affairs in which he had returned his liabilities at £1,830, of which £1,759 were expected to rank for dividend and his assets at a net sum of £75 (see THE CHEMICAL AGE, Vol. VI., p. 150). Examined by the Official Receiver the debtor stated that he commenced business in London in January, 1919, as a chemical merchant. He then possessed a capital of £90 and he carried on the business until November 26, 1920, when he transferred his assets to a company called P. Marcotty & Co., Ltd., which was formed with a nominal capital of £1,500 divided into shares of £1 each. His liabilities at the time amounted to £1,050, while the assets that he transferred consisted of goods £750, office furniture £50, and cash £450, which had been advanced to him. He told two persons whom the Official Receiver named that he intended to transfer to the company. As consideration for the transfer he received 1,495 fully paid shares in the company, of which he was appointed the managing director at a remuneration of £750 per annum. He held that position until December last, when he resigned, and he had since been in employment. The debtor further stated that in 1919 he had entered into a contract to buy 10 tons of oxalic acid for about £950, and at the same time he entered into a contract to sell it to Paulding & Co., Ltd., of Manchester, at a profit to himself of 1½d. a pound. But only five tons were delivered and in consequence he was sued for breach of contract, and on July 15 last judgment was obtained against him for £900 damages and costs. He attributed his failure to that cause, to slackness of trade, and to heavy interest on borrowed money. The examination was concluded.

Alleged Trade Mark Infringement

In the Chancery Division on March 24, Mr. Justice Eve had before him a motion in which the Bayer Co., Inc., of New York, asked for an interlocutory injunction against Mr. A. C. Henry, of London, and the Farbenfabriken Vormals Fried. Bayer & Co., a German company, to restrain the defendants from infringing the plaintiffs' trade marks known as "helmitol," "luminal," "mesotan," "protargol," "tannigen," and "theocin." Mr. Henry, it was stated, is the selling agent of the defendant company in England.

Mr. Maugham, K.C., for the plaintiffs, said the goodwill in these marks had been sold by order of the court from the English Bayer company to the plaintiffs, and the German company were not entitled to use them in this country, although they had been advertising and offering these goods

for sale over here. Sir D. Kerly, K.C., for the defendants, said the defendant company were also on the register for all these marks except "luminal," and they had a statutory right to them. He contended further that the plaintiffs' registration was bad. They had delayed fourteen months since they challenged the defendants, and the latter had been selling ever since. Counsel urged it was not a case in which an injunction should be granted.

His Lordship, having heard the affidavits, said these goods of the defendants had been advertised as long ago as December, 1920, and the plaintiffs must have known then that the German company were refusing to recognise the plaintiffs' exclusive rights to the English use of these trade marks. He doubted whether any serious loss would be inflicted upon either side by allowing matters to remain as they were until the action could be tried. He thought it was a case, however, in which there should be an early trial of the action, but it was too late to ask for an injunction.

No order was therefore made.

Affairs of a Consulting Chemist

A SITTING for the public examination of Mr. John Thomas Norman, consulting chemist, 23, Leadenhall Street, London, was appointed to be held on March 24 at the London Bankruptcy Court before Mr. Registrar Francke. A statement of affairs had been filed in which the debtor's liabilities were returned at £8,840 7s. 6d., of which £3,688 os. 6d. were expected to rank, and the net assets were estimated at £229 1s. 6d. According to his deficiency account the debtor's assets on January 18, 1919, exceeded his liabilities by £2,375, and he had since received gifts from relations amounting to £550. The chief items in explanation of his deficiency were as follow:—Loss in business since January 18, 1919, £687; depreciation of laboratory apparatus and equipment, £400; household and personal expenses, £2,000; and loss in connexion with the acquisition of leases in the Forest of Dean, £2,375. Upon the case being called the Official Receiver informed the court that the statement of affairs was not filed until March 20, and under the circumstances he applied for an adjournment of the examination. His Honour ordered the examination to stand over until May 19.

A Disputed Appointment

At the Sheffield County Court, on March 22, Mr. J. T. Appleton, chemist, of Handsworth, sued Sheaf Turps Producers, Ltd., Grimsthorpe, for £21, one month's salary, in lieu of notice, and expenses. For the plaintiff it was stated that Mr. Albert Frost, chairman of the company, asked him to take a part time appointment as general manager. On February 3 last he interviewed the directors, and was definitely appointed. On the following Monday one of the directors, Mr. Shepherd, was said to have objected to the appointment, and this ended in plaintiff never taking up his duties. He claimed that he was entitled to a month's notice.

Mr. Arthur Frost (secretary of the company) said that two of the directors objected to the appointment after it was made, so he and his brother, Mr. Albert Frost, resigned, because they thought the appointment of Mr. Appleton was in the best interests of the company.

Giving judgment for defendants, his Honour said he was not satisfied that the appointment had been fully and properly made.

TNT and Picric Acid Tests

It is proposed to conduct a study at the Pittsburgh Experiment Station of the U.S.A. Bureau of Mines of the heats of solution of trinitrotoluene and picric acid. It seems that the determination of these constants will be the logical outcome of the work in solubility as they will tend to prove the accuracy of that work. The knowledge of these constants may also help to explain some accidents and enable the manufacturer to avoid others in the industrial fields.

At the same station the Bureau of Mines is making a study of the deterioration of trinitrotoluene during storage. This problem is of importance owing to the large stores of TNT on hand and the question of its storage or immediate use. Material has been examined and carefully tested that has been stored for six years. It does not show appreciable deterioration in stability, strength, or sensitiveness. Further tests are to be made which should show quantitatively the deterioration due to the action of sunlight and heat, as it has been proved that both of these affect TNT.

Chemical Matters in Parliament

Orders Under Safeguarding Act

Replying to Sir A. Fell (House of Commons, March 27), Mr. Baldwin said that eight complaints under Part II. of the Safeguarding of Industries Act had been referred to Committees and five reports had been received. No order had yet been made.

Industrial-grade Arsenic

In reply to Sir Edward Nicholl (House of Commons, March 23), Mr. Baldwin said industrial-grade arsenic differed from the dutiable article as included in the Board of Trade list in that it was produced and refined on a large scale by processes which could not be regarded as fine-chemical processes, but were in the nature of metallurgical processes, whilst the dutiable article was produced by typically fine-chemical processes for use, for instance, as an analytical reagent. The standard of purity required for the reagent was higher than that of the ordinary industrial grades.

Imports of Arsenious Acid

Sir Edward Nicholl (House of Commons, March 23) asked the President of the Board of Trade if he had received any complaint that arsenious acid was being imported into this country under the name of arsenic or powdered white arsenic, which corresponded with the definition of the arsenious acid which was dutiable according to the list of the Board of Trade drawn up under the provisions of the Safeguarding of Industries Act, and that such imports were not bearing the duty imposed by the Act.

Mr. Baldwin said a complaint had been made that arsenious acid was, in fact, of the grade included in the Board of Trade list, and was therefore chargeable with duty. He was, however, unable to agree that the heading in question covered ordinary white arsenic of the grades generally used in industry.

The Cream of Tartar Decision

Replying to Mr. Kiley (House of Commons, March 23), Mr. Baldwin said in regard to the Referee's decisions in the cream of tartar and citric acid inquiry, the Referee decided to allow a period of seven days before signing the award with a view to giving the Board of Trade an opportunity of notifying if it was its desire that judgment should be stated in the form of a case which could be decided in the High Court, and the matter was under consideration. He would point out that the provisions of the Arbitration Act, 1889, applied to these references to the Referee under Section 1 (5) of the Safeguarding of Industries Act. He was also willing to revise the present list if the revision led to improvement, but he could not agree that a state of chaos had resulted from changes in the list.

Decisions against the Board of Trade

Mr. Kiley (House of Commons, March 23) asked the President of the Board of Trade whether he had considered the situation arising out of the fact that the Referee has given judgment, under the Safeguarding of Industries Act, against the Board of Trade in respect of santonine, gas mantles, cream of tartar and citric acid, and sugar of milk; and whether, in view of the fact that these decisions involved principles affecting a considerable number of other commodities in the key industries list as defined by the Board of Trade, and in view of the considerable expenditure of public and of other money involved in contesting these cases, he was prepared to take action to delete from the list commodities whose deletion was logically involved in the judgments already given, and thus save the enormous expense involved in obtaining individual decisions.

Mr. Baldwin said he was aware of the decisions mentioned, but he was not satisfied that the principles underlying them were so definite and of so general application as Mr. Kiley appeared to suggest, or were intended to be so by the Referee. The whole question would, however, be considered in the light of these decisions and of the decisions in other cases which would be taken very shortly.

Anglo-Persian Oil Company

In reply to Lieut.-Commander Kenworthy (House of Commons, March 23), Sir Robert Horne said the articles of association of the Anglo-Persian Oil Co. provided for the appointment of two ex-officio directors by the Treasury, one of whom is chosen to represent the Admiralty directly. The ex-officio directors consult the Admiralty or the Treasury, as the case may be, when they require instructions.

Safeguarding Act Repeal Rumour

Answering Major Mackenzie Wood (House of Commons, March 27), who asked for confirmation or denial of a report published in the daily Press that the Government intended to repeal the Safeguarding of Industries Act, Mr. Baldwin said it was a piece of pure invention.

Sittings of Committees

In reply to questions by Dr. Murray (House of Commons, March 27), Mr. Baldwin said that steps were being taken to shorten the proceedings in future cases of complaints under the Safeguarding of Industries Act. In this connexion he pointed out that the last five cases had been dealt with in six short hearings. A large number of formal notices of complaint were received in respect of cream of tartar, tartaric acid, and citric acid. The amount of duty collected on these commodities was £5,718. This amount could not be refunded, as Section 1 (5) of the Act laid down that any decision of the Referee should be without prejudice to anything previously done.

Dumping Complaints

In reply to Mr. Hogge (House of Commons, March 27), Mr. Baldwin said that in three cases evidence had been adduced by complainants in support of the allegation of dumping, under Section 2 (1) (a) of the Act, but in no instance had a *prima facie* case yet been made out for reference to a committee.

Lists of Dyestuff Licences

Replying to Mr. Mallalieu (House of Commons, March 27), Mr. Baldwin said that lists of licences granted under the Dyestuffs (Import Regulation) Act, were distributed to members of the Licensing Committee, four of whom were representatives of a certain organisation represented on the Committee, who communicated the lists to their association. When it appeared that this practice was causing inconvenience to the Committee it was discontinued.

Importation of Alizarine Direct Blue

Mr. Mallalieu (House of Commons, March 27) asked the President of the Board of Trade if he was aware that on November 29, 1921, the Dyestuffs Advisory Licensing Committee refused to recommend the issue of a licence to import a quantity of a dye not made in the United Kingdom named alizarine direct blue E₃ B O, and suggested that a British-made dye named alizarine blue L A should be used as a substitute; that the user stated the substitute was altogether unsuitable, as it would not stand fast under certain processes; that since December last the Licensing Committee had repeatedly refused to recommend the issue of the licence despite the strongest evidence from the user that he could use no other dye than that for which a licence had been asked for, and that it would mean sending some hundreds of pounds' worth of business abroad where the dye could be obtained; and, if so, did he approve of this action by the Licensing Committee.

Mr. Baldwin said he was in communication with the Committee and would communicate the result later.

Dyes for Film Tinting

Mr. Newbould (House of Commons, March 27) asked the President of the Board of Trade whether he was aware that Zimmermann & Co. (Photographic), Ltd., applied to the Licensing Committee, on December 18 last, for licences to import certain dyes used for tinting purposes by cinematograph film printers; that on December 9 the Committee refused to recommend the issue of such licences unless evidence was produced from the actual consumers showing that similar British-made dyes were not satisfactory for this particular process; that on December 20 and 21 Messrs. Zimmermann forwarded to the Licensing Committee eight original communications from their customers, the film printers, who stated that they had tried all the British-made dyes, which had proved to be entirely unsatisfactory; that, after receiving this evidence, the Licensing Committee again on December 22 refused to recommend the issue of the licences; that on February 1 Messrs. Zimmermann forwarded to the Licensing Committee a further six original communications from their customers, the film printers; and that on February 3 the Committee again refused to recommend the issue of the licences, and gave no reason for such action.

Mr. Baldwin said he was in communication with the Committee and would reply to the question when he received their reply.

Importation of Acid Alizarine, Grey

Major Wood (House of Commons, March 27) asked the President of the Board of Trade if he was aware that an application was recently made to the Dyestuffs Advisory Licensing Committee for a licence to import 6 cwt. of acid alizarine, grey G, a dye not made in the United Kingdom, which was required by consumers in three different industries; that the Licensing Committee granted a licence for 3 cwt. on the express condition that it was to be used in one industry only; and, if so, on what grounds this preference was given to one over other industries.

Mr. Baldwin said the reason for the distinction was that the Committee were of opinion that in the one case an entirely suitable substitute of British manufacture was not available, whilst for the other purposes an adequate substitute was available.

Imports of German Dyes

In answer to Mr. Kiley (House of Commons, March 27), Mr. Baldwin said the stocks of reparation dyestuffs held by the Government were mainly obtained at a time when there was no reason to anticipate any immediate or prolonged decrease in requirements in this country, and were intended to supplement domestic production. Any additional supplies taken under the continuing option given by the Treaty of Versailles would be restricted to dyestuffs not produced in this country, and for which adequate substitutes were not obtainable from British manufacturers. No doubt the slow liquidation of the original stocks, in consequence of the general trade depression, was causing some difficulty to British manufacturers, but that did not appear to be a reason for the repeal of the Dyestuffs Act. There were doubtless alternative courses, such as the distribution of the dyes among firms who had been accustomed to handle them for many years, but he was not in a position to judge without examining the question closely.

Revenue from Safeguarding Act

Sir Robert Horne informed Mr. Kiley (House of Commons, March 28) that the total amount of duty collected under Part I. of the Safeguarding Act from October 1, 1921, to March 25, 1922, was £134,235. Of this amount £19,864, £4,112, £2,540, £3,901, £27,607, and £640 was collected in respect of goods consigned from France, Italy, Belgium, Switzerland, the United States, and Japan, respectively. Approximately £1,500 had been repaid.

Poison Gas Research

Questioned by Mr. Morrison whether, in view of the signature of the agreement at Washington with regard to the prohibition of the use of poison gas in war, it was proposed to close down the experimental ground at Porton, Sir R. Sanders (House of Commons, March 28) said the answer was in the negative. The Government would be failing in its duty if it failed to take all possible steps to protect the country against gas attacks in time of war.

Merchants and the Dyestuffs Committee

Mr. Kiley (House of Commons, March 28) asked the President of the Board of Trade why merchant importers of dyes were not represented on the Dyestuffs' Advisory Licensing Committee, and whether it would be possible to make arrangements for them to be represented.

Sir W. Mitchell Thomson said the constitution of the Committee was fully discussed during the passage of the Dyestuffs Act through the House. He did not think anything had since happened to shake the strength of the arguments then presented.

Inauguration of the Witwatersrand University

THE South African School of Mines and Technology, which was founded just after the Boer War with a score or so of day scholars, is now a full-fledged teaching, examining, and degree conferring University, and will in future be known as the Witwatersrand University. Prince Arthur of Connaught is the first Chancellor. About three years ago the University became one of the constituent colleges in the Federal South African University, and during that period was known as University College, Johannesburg. The growth of the University has been phenomenal, there being at the present time nearly a thousand students following the various prescribed courses, quite apart from a vigorous evening class department.

From Week to Week

M. PHILLIPPE GUYE, Professor of Physical Chemistry at Geneva University, died at his residence there on Monday.

It is reported that the new Anglo-Persian OIL WORKS at Skewen, Neath, may be considerably enlarged in the near future.

MR. ASPINALL BROOKE, of Hipperholme, near Halifax, of Brooke's Chemicals, Ltd., died on March 23, at the age of 73 years.

We regret to record the death on March 22, at Hunterston House, Muirhead, Cathcart, of MR. JOHN CUMMOCK, aged 46, manufacturing chemist, of Glasgow.

SIR ERNEST RUTHERFORD has accepted the nomination of the Council of the British Association to be president for the annual meeting to be held at Liverpool next year.

Dexine, Ltd., of Stratford, London, E., have recently appointed Mr. R. F. Richards, late of Stothert & Pitt, Ltd., as their outside representative for London and district.

At a meeting of the Senate of London University on March 22, the degree of D.Sc. in Physics was conferred upon Miss A. C. DAVIES, an internal student of the Royal Holloway College.

The estimate for the Disposal and Liquidation Commission for 1922-23 includes £25,000 (compared with £150,000 in the current year) for final payments for BORING FOR OIL under the agreement with S. Pearson & Son, Ltd.

The death occurred on March 25, at 82, Cromwell Avenue, Highgate, London, of MR. THOMAS HARPER FRANCIS, aged 85 years, of Willows, Francis, Butler, & Thompson, Ltd., wholesale druggists, of 40, Aldersgate Street, London.

Lecturing on RADIO-ACTIVITY at the Royal Institution on March 25, Sir Ernest Rutherford showed and explained tables dealing with various radio-active minerals. He also illustrated the changes resulting from the expulsion of alpha and beta rays.

At a meeting of the Bedfordshire Chamber of Agriculture on March 25, Dr. E. J. Russell said the CONSUMPTION OF BASIC SLAG in this country had very nearly doubled since 1914, but on the whole slag to-day was only about half as good as that of 1914.

The Royal Commission on Oxford and Cambridge Universities, which investigated the application of those bodies for financial assistance have issued a report which recommends the payment of AN ANNUAL GRANT by the State of £100,000 to Cambridge University.

AN EXPLOSION occurred at the oxyhydrogen works of J. W. Ellis & Co., of Swalwell, Newcastle, on March 22. Twenty workmen were injured. An engine-driver was blown through some iron railings, but was not badly hurt. Plant was destroyed, and the roof of the building was blown off.

While engaged in the repair of an electric motor last week at the works of the CROSS CHEMICAL Co., Camelon, Falkirk, a foreman, John Paterson, was seen to fall to the ground and when picked up was found to be in a dying condition. Medical aid was summoned, but he expired almost immediately.

MR. J. S. REMINGTON, of the Analytical and Technical Laboratories, Aynsme, nr. Grange-over-Sands, announces the disposal of his business to Mr. H. H. Ward. The business will be continued under the style of Stewart, Remington & Ward, and Mr. Remington's services will be retained in an advisory capacity.

THE FUEL RESEARCH BOARD of the Department of Scientific and Industrial Research, at the suggestion of their Irish Peat Inquiry Committee, arranged for the translation from the German of Hausding's handbook on the Winning and Utilisation of Peat, and the volume may now be obtained from H.M. Stationery Office.

Speaking last week at the Swansea Chamber of Commerce, Sir Alfred Mond said that to improve the present state of trade we must not be afraid to spend what was left to us in trying to induce people to buy our goods. There was no doubt that sales could greatly be increased if people would SPEND MORE MONEY ON ADVERTISING.

The annual report for 1920 of the Department of Conservation and Development, New Jersey, refers to the value of glauconitic marl and greensand as SOURCES OF POTASH. It

is stated that at Elmwood Station, where green marl is 49 ft. thick, an acre of land covers approximately 9,400 tons of potash and that the average potash content of the marl over a wide area is as high as 6.60 per cent.

The late Mr. Holman Hunt's experiments on the PERMANENCY OF ARTISTS' OIL COLOURS were the subject of a paper read by Professor A. P. Laurie, professor of chemistry at the Royal Academy, before the Royal Society of Arts on Wednesday, March 22, when Sir Aston Webb presided. Professor Laurie stated that, as a result of experiments, most of the modern artists' pigments were proved reliable, with the possible exception of pale Cadmium and Cobalt yellow.

The next meeting of the London Section of the Society of Chemical Industry will be held in the rooms of the Chemical Society, Burlington House, London, on Monday next, at 8 p.m., when a paper will be read on "The Influence of Structure on the Combustibility and other Properties of Solid Fuels" by E. R. Sutcliffe and Edgar C. Evans. The members of the Section are invited to dine together before the meeting at the St. James' Restaurant (A. B. C., Ltd.), 178, Piccadilly, opposite Burlington House, at 6.30 p.m.

The Secretary for Mines has, at the request of the Mining Dangers Research Board, appointed the following to act as a SUB-COMMITTEE ON TECHNICAL APPLIANCES: Colonel W. C. Blackett (chairman), the Right Hon. W. Brace, Mr. C. P. Sparks (consulting engineer to the Powell Duffryn Co.), Dr. R. V. Wheeler (Director of Research), and Mr. C. D. Mottram (Senior Inspector of Mines), who will also act as secretary. Communications for the sub-committee may be forwarded to Mr. C. D. Mottram, County Hotel, Newcastle-on-Tyne, or Mines Department, 46, Victoria Street, London.

Owing to the REDUCED PRODUCTION OF LEAD CONCENTRATES at the Central Mine due to the shortening of working hours by the Edmunds award and to the greatly reduced supply of outside ores for treatment, the Sulphide Corporation, Ltd., New South Wales, will suspend lead smelting operations at its Cockle Creek works at the end of April, and its production of lead concentrates will be treated by the Broken Hill Associated Smelters at their Port Pirie smelting works on terms which, owing to centralisation of tonnage, compare advantageously with those of treatment at Cockle Creek. The acid and superphosphate plants will continue in operation.

MR. EDMUND V. SALAMAN, a director of Lever Brothers, Ltd., and Chairman of the Vinolia Co., Ltd., died at Margate on March 23. Mr. Salaman, who resided at Egerton House, Egerton Park, Rock Ferry, joined the London branch of Lever Brothers in 1887, and was one of the oldest members of the firm. He was appointed a director in 1910, and for some years controlled the export department at Port Sunlight, retiring from that position in June last year, when he became chairman of the Vinolia Co. In his earlier days he was a member of the Artists' Rifles, and during the war was an officer of the Port Sunlight Company of the 4th Cheshire Volunteers.

Circulars have been issued by the Colston University Research Society drawing attention to the effort now being made by the society to found RESEARCH FELLOWSHIPS in the University of Bristol. Industrial firms and others are asked to subscribe £150 for one year only for the support of a fellowship for one year in any one of the various faculties (arts, medicine, chemistry, physics, engineering, &c.) in the University. Each fellowship would be known by the name of the donor, and would be awarded to a student who had completed his ordinary training. It is suggested that firms, in founding a fellowship, might select some subject of research connected with the problems of their own business.

THE STRIKE OF CHEMICAL WORKERS in South Wales still continues, being now in its fifth week. Though no acid is coming from the customary sources, the tinplate works are able to continue in operation, owing to acid being imported to them from outside the area affected by the dispute. The chemical workers and the tinplaters have met in joint conference to discuss the matter, and the result is an official statement by the former that the latter, "having now been put in possession of the facts, have decided to support the chemical section even to the extent of withholding their labour." Hauliers have been asked to refuse to handle acid supplies to tinplate works from outside sources, and tinplaters have been requested not to work on plates on which locally made acid has been used.

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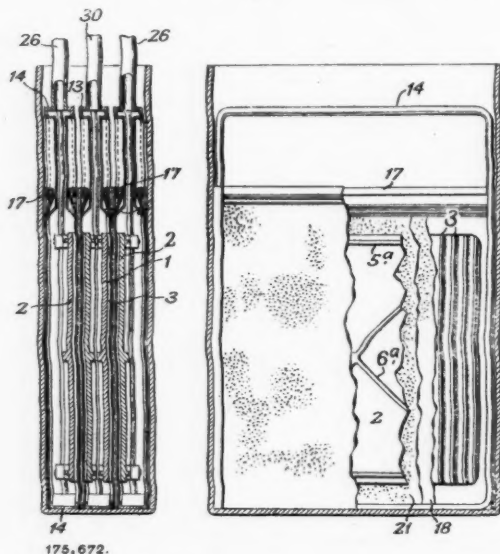
Abstracts of Complete Specifications

175,670. CARBONISING COAL AND THE LIKE, METHOD OF. G. P. Lewis, 9, Dacre Street, Westminster, London, S.W.1. Application date, August 31, 1920.

The process is for distilling fuel such as lignite, brown coal, and peat. The raw material is dried, powdered, and mixed with a liquid such as coal tar creosote to form a paste. The paste is then ground and mixed with coal tar, coal tar fractions of the heavier grades, or other suitable hydrocarbons to form a liquid mixture. If the raw material is acid, lime or other alkali may be added at this stage. The liquid is passed under pressure through heated pipes of small bore at a high speed. Sufficient pressure is maintained (up to 25 atmospheres) to prevent the evolution of gas, and the temperature is kept approximately at 500°C. The liquid is then injected into a chamber in which the liquid portion is vaporised and partly cracked, and the vapour passes into a condenser where low-boiling hydrocarbons and ammonia are separated from the permanent gases. The liquid residue is further heated to distil off motor fuel, solvent naphtha, illuminating and lubricating oils, &c. Further heating yields heavy oils, and the residue may be formed into briquettes which may be distilled to yield gas oil, ammonia, and hard coke.

175,672. ELECTROLYTIC CELL. J. Harris, 1229 Manor Park Avenue, Lakewood, Ohio, U.S.A., and J. R. Rose, Edgeworth, Pa., U.S.A. Application date, September 13, 1920.

The cell is mainly intended for the electrolytic production of oxygen and hydrogen. The anodes and cathodes 1 and 2 are constructed of galvanised cast iron, square in outline. The gas-generating surface of each anode is provided with vertical V-shaped ribs 3, and the rear surface is provided with a rib 5a extending around the periphery, and with diagonal ribs 6a.



The cathodes are of similar construction except that the corresponding ribs 3 are arranged midway between the ribs on the corresponding anode. When the anodes and cathodes are assembled they are arranged in frames 13, 14, the upper ends of which extend considerably above the top of the plates to provide collecting chambers for the gases. Discharge pipes 26, 30 for the gases are connected to the tops of the collecting chambers. The anode and cathode plates 1 and 2 are enclosed between asbestos diaphragms 18, 21, the upper ends of which are secured to bars 17. Each diaphragm is in contact with vertical ribs on the electrode along the edge of the rib only, so that no surface is provided for the formation of a film of liquid.

175,795. SODIUM PENTABORATE FROM BORON ORES, PROCESS FOR THE PRODUCTION OF. K. Harding, The Glen, Howwood, Renfrewshire, Scotland, and B. D. Jones, 14, Maitland Park Villas, Haverstock Hill, London, N.W.3. Application date, December 3, 1920.

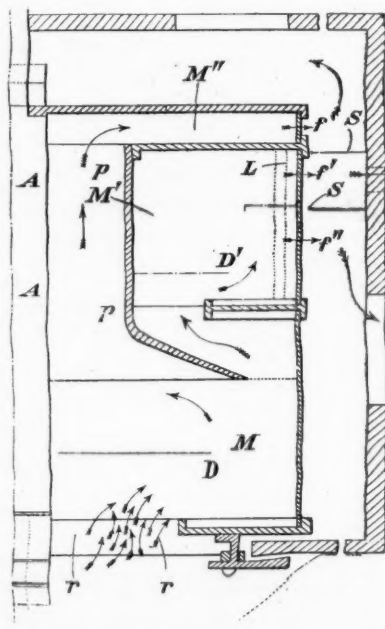
The process is for obtaining sodium pentaborate $\text{Na}_2\text{B}_{10}\text{O}_{16} \cdot 10\text{H}_2\text{O}$ from boron ores such as colemanite, boracite, ulexite, or the like. The ore is mixed with nitre cake or any other substance containing sulphuric acid and soda, and sulphuric acid. The nitre cake is employed in a proportion slightly in excess of that necessary to convert all the boron oxide to sodium pentaborate. The sulphuric acid should be in such proportion that its SO_3 content, together with the SO_3 in the nitre cake, is sufficient to convert all the calcium oxide present in the ore as calcium borate, into calcium sulphate. The excess of nitre cake is used to prevent any reverse action between the sodium pentaborate solution and the calcium sulphate. The sodium pentaborate is filtered and crystallised.

175,814. GRINDING AND CRUSHING MILLS. C. E. V. Hall, 26, Paradise Square, Sheffield, and S. J. A. Mills, Cannonfields, Hathersage, Derby. Application date, December 9, 1920.

The pulverising mill is of the kind in which a gyratory crusher of the pendulum type rotates in contact with a mortar. The vertical shaft carrying the roller is provided with a driving head of curved non-circular shape enclosed loosely in a driving box so as to allow the necessary oscillation of the shaft. The grinding chamber is enclosed in a double sieve, the inner of which is of finer mesh to retain the finest product of the grinding.

175,840. CENTRIFUGAL MEANS FOR THE SEPARATION OF GASEOUS MIXTURES. E. N. Mazza, 5, Via Biamonti, Turin, Italy. Application date, December 21, 1920.

The gaseous mixture to be separated is admitted through openings r surrounding the central vertical shaft A of the apparatus. The gases are deflected by a diaphragm D in a radial direction into a compartment M, where they are subjected to centrifugal force, so that the lighter constituents occupy the inner zone. These constituents pass upwards through the central passage p into the upper compartment M' and thence through the openings f into the casing. The heavier gases pass into the smaller compartment M', where they are deflected by a baffle D' against the outer wall, where a further separation takes place, and the intermediate and heavier gases are discharged through openings $f'f''$. The gases when delivered to the outer casing are prevented from mixing by partitions S, and are finally withdrawn through openings in the wall of the casing. The separation of the two gases in the compartment M' is effected by means of curved, radial and tangential baffles which deflect the gases through the openings $f'f''$. The separation of the gases into two streams is finally effected by the edge L of a curved plate which is adapted to be radially adjusted so that a mixture of gases in any desired proportions may be obtained.



175,888. **COKING OF COAL.** S. R. Illingworth, 6, Llantwit Road, Treforest, Glamorgan. Application date, February 2, 1921. Addition to 164,104.

When highly bituminous coal is carbonised at temperatures up to 600°C. the coke obtained is soft and porous, and is liable to disintegrate. In this invention a low-temperature coke which is dense and hard is obtained without the use of a binder such as pitch, and without mechanical compression. The coal is first preheated, then crushed, and carbonised at a temperature preferably not above 500°C. All the bituminous material is thus carbonised, and a porous coke is obtained. This product is passed through an oven heated to 600°–1,000°C., which eliminates all volatile matter and yields a smokeless fuel. In an example, coal is heated in thin layers to 350°C. for 1½ hours, and loses 10 per cent. by weight. The product is crushed and heated to 480°C. with the formation of coke and distillation of oil. This coke may be heated to 900°C. for 1½ hours to yield metallurgical coke, with oils and ammonia as by-products. It is found that coke is formed at temperatures of 350°–500°C. and that some coals of a high volatile content which do not usually coke may be caused to do so if preheated so as to leave 5–6 per cent. of resinous material in the coal. If by-products are required suitable for refining into substitutes for natural petroleum products, the coal is coked at a temperature not above 500°C. If by-products for use as a fuel are required, a coking temperature of 500°–600°C. is employed. The coke obtained in the latter case is more porous, but this may be minimised by preheating to a higher temperature. The process may be carried out by feeding the material on to trays forming an endless chain extending round an oven heated by flues. After their passage through the oven, the trays discharge their contents through a shoot into a retort in which the coke is heated to a higher temperature.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention. 156,543 (Farbenfabriken vorm. F. Bayer & Co.) relating to separating or isolating organic gases or vapours of organic products, see Vol. IV., p. 376; 161,159 (Soc. Generale d'Evaporation Procédes Prache et Bouillon) relating to apparatus for leaching minerals, see Vol. IV., p. 654.

International Specifications not yet Accepted

174,360. **MOTOR FUEL.** F. Hostettler, 9, Mayweg, Berne Switzerland. (Assignee of J. Dolfin, 43, Obere Dufourstrasse, Berne, Switzerland.) International Convention date, January 24, 1921.

A liquid fuel for internal combustion engines consists of a mixture of 40–50 per cent. of tar distillate passing over between 75°–130°C., 40–50 per cent. of raw oil distillate passing over between 50°–360°C. and 3–5 per cent. of dehydrated wood spirit. The tar oils may be obtained from pit-coal, brown coal, lignite, peat, &c.

174,364. **ALKALI CYANIDES.** Deutsche Gold- & Silber-Scheide-Anstalt vorm. Rössler, 7, Weissfrauenstrasse, Frankfurt-on-Main, Germany. International Convention date, January 21, 1921.

Hydrocyanic acid or gas containing it is passed into a solution of sodium carbonate or sulphate mixed with a small excess of lime. Alkali cyanide and an insoluble calcium salt are obtained.

174,370. **PHOSPHATES.** Rhenania Veren Chemischer Fabriken Akt.-Ges. Zweigniederlassung Mannheim, Wohlgelegen, Mannheim, and F. Rusberg, 4, Uhlandstrasse, Mannheim, Germany. International Convention date, January 24, 1921.

A mixture of crude phosphate and alkali sulphate is treated with hydrochloric acid gas in presence of water to produce soluble phosphates. Several methods of adding the necessary water are described. (1) Substances such as infusorial earth, which may contain water while still powdery, may be added. (2) Natural water-containing substances such as brown coal may be added. (3) The water may be added alone in small successive quantities.

174,379 and 174,380. **CONCENTRATING ORES.** Hernádvölgyi Magyar Vasipar Részvény Társaság, 36, Nador ucta, Buda Pest. International Convention dates, September 28, 1916, and April 10, 1918.

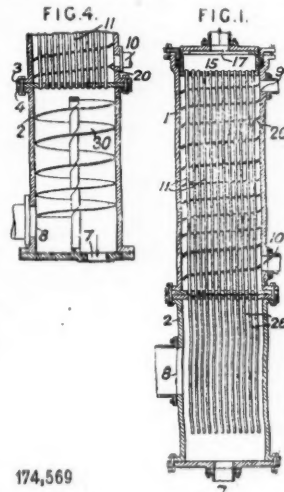
174,379. In the froth-flotation process, air is introduced by a pipe into the bottom of a vessel containing ore pulp, and the mixture of pulp and air is circulated upwards through

vertical passages at the side of the vessel. The froth is discharged at the top and the gangue returns downwards through the central space.

174,380. Compressed air saturated with oil is injected into the ore pulp by a centrifugal sprinkling jet near the bottom of the vessel, and the mixture passes upwards along the walls of the vessel, the froth being discharged at the top.

174,569. **FRACTIONAL CONDENSATION OF VAPOURS.** Griscom-Russell Co., 90, West Street, Manhattan, New York. (Assignees of C. Jefferson, 867, West 181st Street, Manhattan, New York.) International Convention date, January 25, 1921.

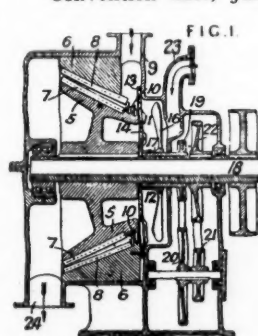
A mixture of vapours derived from petroleum or the like passes into the apparatus through an inlet 8, and then upwards through pipes 26. Heavy fractions are condensed and withdrawn through the outlet 7. The remainder of the vapour passes upwards through the pipes 11, which are cooled by a cooling agent admitted and discharged through openings 9, 10. A spiral baffle 20 causes a circulation of the liquid. The pipes 11 are fixed in a hollow head 15, movable in the casing to allow expansion of the tubes, and having a vapour outlet 17. In an alternative, the lower casing 2 may contain a helical baffle 30, so that the condensate from the pipes 11 flows in counter-current to the rising vapour. The conditions of condensation are varied by varying the rate of flow or temperature of the cooling agent.



174,574. **CRACKING OILS.** Chemical Research Syndicate, Ltd., 7644, Woodward Avenue, Detroit, Mich., U.S.A. (Assignees of A. S. Ramage, 7644, Woodward Avenue, Detroit, Mich., U.S.A.) International Convention date, January 28, 1921.

Heavy fuel oils, crude oils, &c., are vaporised, mixed with steam, and passed over heated ferrous oxide. Oxidation or reduction of the ferrous oxide is avoided by adjusting the proportions of oil and steam. The ferrous oxide is obtained by reducing ferric oxide in tubes. Fuel for internal combustion engines is obtained by heating the inlet end of the tube containing the ferrous oxide to 500°C. at the inlet end and 620°C. at the outlet end. If the temperatures are 600°C. and 700°C. a lighter spirit is obtained.

174,589 and 174,590. **GRINDING, CRUSHING, &c.** A. J. G. Coppens, 9, Schie, Schiedam, Holland. International Convention date, January 25, 1921.



174,589

174,589. Material is supplied through a passage 9, and fed by a conveyor 10 between grinding cones 5, 6, having knife edges 7, 8. A wire screen 11 separates the grinding space from the air chamber 12. Air is drawn in through a passage 23 and delivered by a fan 16 through the grinding space so that the ground product is discharged through an outlet 24. The fan 16 is driven by a pulley 19 through belt gearing 20, 21, 22 from the shaft 18.

174,590. Material is ground between two circular discs, one fixed and the other rotating, each being slightly dished to enclose a space for the material. Each disc is provided with concentric rows of projections so disposed that the circular rows of projections on one disc pass between those on the other disc. The circumferential gaps between adjoining

projections in each row increase in length in successive rows, i.e., the projections, from the centre outwards, are bounded by radial lines.

- 174,581. ALKALI SILICATES. C. Deguide, 20, Avenue de Ceinture, Enghien, Seine-et-Oise, France. International Convention date, January 22, 1921.

Barium silicates having the composition SiO_2 , 1—3 BaO are treated with alkali carbonate or sulphate and water to obtain alkali silicate. The barium carbonate or sulphate may be separated and converted into silicate by heating with silica or silica and carbon to 1,300°–1,500°C. Mono-barium silicate may be obtained from more basic silicates by treating with water. The sodium silicate obtained may be caustified by lime.

- 174,599. CALCIUM CYANAMIDE. Soc. l'Azote Français, 126, Rue de Provence, Paris. International Convention date, January 25, 1921.

To obtain stable granules of calcium cyanide, a homogeneous paste is made by mixing with 15–20 per cent. of water and moulding under very high pressure. The mixture is forced through holes in one of a pair of rollers in contact, and breaks in small pieces in the inside. Calcium nitrate solution may be used instead of water.

LATEST NOTIFICATIONS

- 177,149. Apparatus for thermometric analysis. Soc. Anon. de Commentary, Fourchambault and Decazeville. March 15, 1921.
177,174. Manufacture of chromates and bichromates. Joune, A. J. B., Helbronner, A., and Soc. Hydroelectrique and Metallurgique du Palais. March 17, 1921.
177,177. Continuous distillation of wood. Porte, R. March 19, 1921.

Specifications Accepted, with Date of Application

- 154,938. Coal distillation products, Manufacture of. E. Fleischer. December 8, 1916.
156,798. Continuous crystallisation of solutions, Apparatus for effecting. Norsk Hydro-Elektrisk Kvaestofaktieselskab. September 17, 1914.
157,287. Purifying and treating gases, Apparatus for. H. Hernu. December 9, 1918.
164,757. Tropinone-mono-carbonylic acid esters, Process for the preparation of. E. Merck (Firm of), O. Wolfes, and H. Maeder. June 16, 1920.
176,400. Recovery of ammonia in the ammonia-soda process. E. W. Pattison. (Mathieson Alkali Works, Inc.) September 3, 1920.
176,420. Cellulose derivatives, Manufacture of. H. Dreyfus. October 6, 1920.
176,428. Tungsten ores and residues containing oxides of tungsten, Purification of. W. H. Dyson and L. Aitchison. October 28, 1920.
176,446. Separation of liquids and solids. J. Avrutik. November 8, 1920.
176,476. Carbon, Manufacture of. British Thomson-Houston Co., Ltd. (General Electric Co.) December 2, 1920.
176,533. Regenerative coke ovens. Coke & Gas Ovens, Ltd., and H. F. Kimbell. December 14, 1920.
176,540. Liquid oils and solvents containing oils in solution, Process for removing suspended matters from. H. Hey. December 16, 1920.
176,577. Saponaceous compositions, Manufacture of. F. G. Chadbourne. January 10, 1921. Addition to 160,892.
176,588. Zinc oxide, Manufacture of. A. Pearson. January 17, 1921.
176,619. Rotary filter. R. M. Johnson and G. C. Hurrell. February 4, 1921.
176,713. Electrical precipitation apparatus. Lodge Fume Co., Ltd., and N. Stallard. May 21, 1921.
176,729. Oxides of chromium, Purification of ores and residues containing. W. H. Dyson and L. Aitchison. October 28, 1920.

Applications for Patents

- Chemische Fabrik Grünau Landshoff & Meyer Akt.-Ges. Kahlbaum Chemische Fabrik Ges., Bergel, S., and Marks, E. C. R. Process for production of an anti-syphilis substance. 8483. March 23.
Correllis, D. H. Centrifugal separation of solids from liquids. 8439. March 23.
Dreyfus, H. Manufacture of cellulose derivatives. 8602, 8603, 8604, 8605. March 24.
Ernst, W. E. Devices for thermostatically controlling flow of liquids or gases in conduits. 8638. March 24. (Germany, July 21, 1921.)
Evans, E. V. Purification of gases from hydrogen sulphide. 8105. March 20.

Farbwerke vorm. Meister, Lucius, & Brüning. Manufacture of stable, dry and readily-soluble vat-preparations for dyeing. 8254. March 21. (Germany, March 26, 1921.)

Hughes, A. W., and Commin, F. J. Treating carbon. 8654. March 25.

Lead Products Syndicate, Ltd., and Barton, J. V. Apparatus for manufacture of lead oxide. 8159. March 21.

— Apparatus for depositing and conveying light substances in suspension in effluents, &c. 8160. March 21.

Lebbin, G. Process for production of carbonic acid baths. 8172. March 21.

Lessing, R. Manufacture of neutral sulphate of ammonia. 8615. March 24.

Mackenzie, R. S. Alloys containing chromium and iron. 8365. March 22.

Moeller, W. Manufacture of products soluble in water from hydrocarbons of high boiling point of tar oils. 8708. March 25.

Moseley, V. Destructive distillation of carbonaceous and oil-bearing materials. 8009. March 20.

Nobel, L. A. Production of ferro-chromium alloys. 8478. March 23.

Norske Molybdenprodukter Aktieselskabet. Alloys of molybdenum 8013. March 20. (Germany, March 26, 1921.)

Oddie, W. M. Apparatus for separating dust, &c., from air and gases. 8427. March 23.

Phillips, A. W. Cellulose ester, and process of forming same. 8492. March 23. (United States, March 24, 1921.)

Quinan, K. B. Manufacture of superphosphate. 8480. March 23.

Ruymbeke, J. van. Production of alcohol. 8367. March 22.

Soc. Chimique de la Grande-Paroisse (Azote et Produits Chimiques). Apparatus for synthesis of ammonia. 8251. March 21. (France, March 31, 1921.)

Soc. of Chemical Industry in Basle, and Imray, O. Y. Manufacture of a derivative of pyrazolone and of dyestuffs therefrom. 8375. March 22.

South Metropolitan Gas Co., and Stanier, H. Purification of gases from hydrogen sulphide. 8105. March 20.

Stephan, C. Process for production of sulphurous acid compounds of isatinanilides (arylides). 8059. March 20.

Vautin, C. T. J. Process for separating nitro-aromatic compounds from explosives, &c. 8167. March 21.

Study of Fractionating Towers

MR. H. H. HILL, refinery engineer of the U.S.A. Bureau of Mines, has made trips to refineries in different sections of the country to obtain information regarding the types of fractionating towers now in use. Data have been obtained on the methods of constructing various types of fractionating devices, the costs of construction, condensing surface, and efficiency of different installations. A large number of the smaller refineries in America do not make use of fractionating towers of any kind, although they could materially increase the amount of gasoline obtained from a certain charge of crude oil without affecting the quality of the product. This subject is of particular interest at the present time owing to the wide difference in prices between gasoline and kerosene, for, by the use of fractionating towers, considerable amounts of the lighter fractions that are now being run into kerosene could be included with the gasoline fraction without raising the end point of the finished gasoline. It is intended to collect all the information available regarding the advantages of fractionating towers and to publish this information in the form of a Bureau of Mines bulletin for the benefit of the small refiner.

L.C.C. Scholarships Offer

THE London County Council is prepared to award Intermediate Scholarships and Free Places to students desirous of entering chemical trades in the following technical schools:

GENERAL COURSES.—Battersea Polytechnic, South Western Polytechnic, Finsbury Technical College, Northern Polytechnic (Works Chemist's course).

SPECIAL COURSES.—Leathersellers Company's Technical College (leather manufacture), Northern Polytechnic (rubber), Borough Polytechnic (bakery and confectionery).

These scholarships and free places are, as a rule, tenable for two or three years, but not beyond the end of the school year in which the age of nineteen is attained. They provide free tuition in approved day courses and (in certain cases) an annual grant, determined in accordance with the scale set out in Schedule 3 on page 48 of the Council's Scholarships and Training of Teachers Handbook, which can be purchased through any bookseller or direct from the publishers, Messrs. P. S. King & Son, 2 and 4, Great Smith Street, Victoria Street, Westminster, S.W. 1.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, MARCH 30, 1922.

THE recent moderate improvement in the demand for chemical products has continued during the current week.

There has been a certain amount of activity in some products, while again others have been quiet. Buyers still limit their orders, however, to their early requirements; usually delivery is required immediately. Despite the fresh break in the German exchange, prices remain on the whole firm and the outlook is more promising. Secondhand parcels in the hands of weak holders are sensibly diminishing, and this of course has the effect of making prices in general much more stable.

Export trade still continues poor, with no outstanding feature.

General Chemicals

ACETONE is nominally without change, but trade has been quieter.

ACID ACETIC has been in strong demand, but is exceedingly scarce. The price is very firm.

ACID CITRIC has registered a further small advance and is in better demand.

ACID FORMIC continues unchanged and in moderate request.

ACID LACTIC is quietly steady, but the demand is small.

ACID OXALIC has maintained the higher level of value and stocks are very small.

ACID TARTARIC has been more satisfactory and a better business is reported.

BARIUM CHLORIDE has been in very strong demand and the price has advanced.

BLEACHING POWDER is in moderate demand at new prices.

CREAM OF TARTAR.—Owing to the recent decision the price of the imported material has firmed up considerably on the Continent, and more interest is now being taken in this product.

FORMALDEHYDE has barely maintained its value and is in small request.

LEAD ACETATE has been a better market, but the price remains at its recent low level.

LEAD NITRATE is quietly steady.

LITHOPONE has been in poor request, but the price is without change.

POTASH CARBONATE.—Only a moderate business is reported, and with any fair amount of business concessions could be obtained.

POTASH CAUSTIC is weak and business is negligible.

POTASH PERMANGANATE has maintained its recent advance and stocks are extremely light.

SODIUM ACETATE has been interesting and there are some good inquiries in the market.

SODIUM BICHRONATE.—Home trade makers have reduced their price by $\frac{1}{4}$ d. per lb. for spot delivery, thus meeting the competition of the imported article.

SODIUM BISULPHITE is in request and to-day's value appears very cheap.

SODIUM NITRITE has only been a moderate market.

SODIUM PRUSSATE has not been quite so active, but the price is exceedingly firm.

ZINC OXIDE has been in demand.

Coal Tar Intermediates

No great volume of business is passing as yet, but a fair number of orders have been received, and in a number of cases stocks are very short.

ALPHA NAPHTHOL.—There are no very great stocks available and the price is firm.

ALPHA NAPHTHYLAMINE is rather firmer and resale parcels appear to be pretty well cleared.

ANILINE OIL and SALT pass steadily into consumption at makers' price.

BENZIDINE BASE is quiet and steady.

BETA NAPHTHOL is without change.

BETA NAPHTHYLAMINE is weak on the appearance of more spot parcels.

DIMETHYLANILINE is steady.

DINITROCHLOROBENZOL continues in good demand with the price firm.

DIPHENYLAMINE.—There is no great stock available and the price is hard.

"H" ACID is very firm with a decent demand, and resale stocks clear.

PARANITRANILINE.—A fair business has been done and this intermediate is the turn firmer.

PARAPHENYLENEDIAMINE is without change.

Coal Tar Products

THERE has been little change in the position of coal tar products generally during the last week.

90's BENZOL is plentiful and is quoted at 2s. 1 $\frac{1}{4}$ d. on rails at works.

PURE BENZOL is in poor demand and is worth 2s. 7d. on rails in the north and about 2s. 11d. in the south.

CREOSOTE OIL is in poor demand and supplies are plentiful. It is worth about $\frac{1}{4}$ d. per gallon on rails in the north and about 5d. in the south.

CRESYLIC ACID is quoted at 2s. per gallon on rails for the pale quality, while the dark quality is worth about 1s. 9d.

SOLVENT NAPHTHA can be bought at 2s. 1d. per gallon on rails. HEAVY NAPHTHA has a poor inquiry and is worth about 1s. 10d.

NAPHTHALENE.—There is practically no business doing for this product, and it is nominally worth about £5 to £7 for the crude qualities, while the refined is quoted at £15 a ton.

PITCH.—The pitch market is inactive and buyers are holding off in the anticipation of being able to cover their requirements at a lower price later on. To-day's values are 77s. 6d. f.o.b. London; 75s. f.o.b. east coast; and 72s. 6d. f.o.b. west coast.

Sulphate of Ammonia

The position is unchanged, and there is still a good demand, both for home trade and export.

Current Prices

Chemicals

	Per	£	s.	d.	to	£	s.	d.
Acetic anhydride.....	lb.	0	1	10	to	0	2	0
Acetone oil	ton	77	10	0	to	80	0	0
Acetone, pure.....	ton	77	10	0	to	80	0	0
Acid, Acetic, glacial, 99-100%....	ton	55	0	0	to	60	0	0
Acetic, 80% pure	ton	47	0	0	to	48	0	0
Arsenic	ton	90	0	0	to	95	0	0
Boric, cryst.....	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39-40%.....	lb.	0	0	6 $\frac{1}{2}$	to	0	0	7
Citric	lb.	0	2	0	to	0	2	0 $\frac{1}{2}$
Formic, 80%	ton	72	10	0	to	75	0	0
Gallic, pure.....	lb.	0	3	4	to	0	3	6
Hydrofluoric	lb.	0	0	8 $\frac{1}{2}$	to	0	0	9
Lactic, 50 vol.....	ton	40	0	0	to	43	0	0
Lactic, 60 vol.....	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.....	ton	30	0	0	to	31	0	0
Oxalic	lb.	0	0	8 $\frac{1}{2}$	to	0	0	9
Phosphoric, 1.5	ton	43	0	0	to	45	0	0
Pyrogallic, cryst.....	lb.	0	6	6	to	0	6	9
Salicylic, Technical	lb.	0	0	10 $\frac{1}{2}$	to	0	1	0
Salicylic, B.P.....	lb.	0	1	4	to	0	1	6
Sulphuric, 92-93%.....	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	2	9	to	0	3	0 $\frac{1}{2}$
Tartaric	lb.	0	1	4	to	0	1	4
Alum, lump.....	ton	12	10	0	to	13	0	0
Alum, chrome.....	ton	30	10	0	to	32	0	0
Alumino ferric.....	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%....	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%....	ton	13	10	0	to	14	10	0
Ammonia, anhydrous.....	lb.	0	1	8	to	0	1	10
Ammonia, .880.....	ton	35	0	0	to	37	0	0

	Per	£	s.	d.	to	£	s.	d.
Ammonia, .920.....	ton	22	0	0	to	24	0	0
Ammonia, carbonate.....	lb.	0	0	4	to	—	—	—
Ammonia, chloride.....	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)...	ton	35	0	0	to	37	10	0
Ammonia, nitrate.....	ton	55	0	0	to	60	0	0
Ammonia, phosphate.....	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide.....	lb.	0	3	0	to	—	—	—
Amyl acetate.....	ton	175	0	0	to	185	0	0
Arsenic, white, powdered.....	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%.....	ton	12	10	0	to	13	0	0
Barium, Chlorate.....	lb.	0	0	11	to	0	1	0
Chloride.....	ton	16	0	0	to	17	10	0
Nitrate.....	ton	32	0	0	to	35	0	0
Sulphate blanc fixe, dry.....	ton	24	0	0	to	25	0	0
Sulphate, blanc fixe, pulp.....	ton	15	0	0	to	16	0	0
Sulphocyanide, 95%.....	lb.	0	1	6	to	—	—	—
Bleaching powder, 35-37%.....	ton	13	0	0	to	13	10	0
Borax crystals.....	ton	29	0	0	to	33	0	0
Calcium acetate, Brown.....	ton	8	0	0	to	9	0	0
Grey.....	ton	11	0	0	to	12	0	0
Calcium Carbide.....	ton	16	0	0	to	17	0	0
Chloride.....	ton	7	10	0	to	8	0	0
Carbon bisulphide.....	ton	60	0	0	to	62	0	0
Casein, technical.....	ton	75	0	0	to	80	0	0
Cerium oxalate.....	lb.	0	3	6	to	0	3	9
Chromium acetate.....	lb.	0	1	1	to	0	1	3
Cobalt acetate.....	lb.	0	11	0	to	0	11	6
Oxide, black.....	lb.	0	10	6	to	0	11	0
Copper chloride.....	lb.	0	1	3	to	0	1	0
Sulphate.....	ton	28	10	0	to	29	0	0
Cream Tartar, 98-100%.....	ton	120	0	0	to	125	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde, 40% vol.....	ton	72	10	0	to	75	0	0
Formosol (Rongalite).....	lb.	0	3	9	to	0	4	0
Glauber salts, commercial.....	ton	4	5	0	to	4	10	0
Glycerine, crude.....	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.....	gal.	0	2	5	to	0	2	6
Iron perchloride.....	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas).....	ton	4	0	0	to	4	5	0
Lead acetate, white.....	ton	42	0	0	to	43	0	0
Carbonate (White Lead).....	ton	40	0	0	to	44	0	0
Nitrate.....	ton	46	10	0	to	48	10	0
Litharge.....	ton	35	10	0	to	36	0	0
Lithopone, 30%.....	ton	24	0	0	to	25	0	0
Magnesium chloride.....	ton	10	0	0	to	10	10	0
Carbonate, light.....	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial).....	ton	8	0	0	to	8	10	0
Sulphate (Druggists').....	ton	13	10	0	to	14	10	0
Manganese, Borate.....	ton	70	0	0	to	75	0	0
Sulphate.....	ton	70	0	0	to	75	0	0
Methyl acetone.....	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone.....	ton	72	0	0	to	73	0	0
Nickel sulphate, single salt.....	ton	61	0	0	to	62	0	0
Ammonium sulphate, double salt.....	ton	62	0	0	to	64	0	0
Potash, Caustic.....	ton	34	0	0	to	35	0	0
Potassium bichromate.....	lb.	0	0	7½	to	—	—	—
Carbonate, 90%.....	ton	31	0	0	to	33	0	0
Chloride 80%.....	ton	15	0	0	to	20	0	0
Chlorate.....	lb.	0	0	4½	to	0	0	5
Meta bisulphite, 50-52%.....	ton	84	0	0	to	90	0	0
Nitrate, refined.....	ton	45	0	0	to	47	0	0
Permanganate.....	lb.	0	0	9	to	0	0	10
Prussiate, red.....	lb.	0	3	9	to	0	4	0
Prussiate, yellow.....	lb.	0	1	2	to	0	1	2½
Sulphate, 90%.....	ton	20	0	0	to	22	0	0
Salammoniac, firsts.....	cwt.	3	5	0	to	—	—	—
Seconds.....	cwt.	3	0	0	to	—	—	—
Sodium acetate.....	ton	25	0	0	to	26	0	0
Arsenate, 45%.....	ton	45	0	0	to	48	0	0
Bicarbonate.....	ton	10	10	0	to	11	0	0
Bichromate.....	lb.	0	0	5½	to	—	—	—
Bisulphite, 60-62%.....	ton	25	0	0	to	27	10	0
Chlorate.....	lb.	0	0	3½	to	0	0	4
Caustic, 70%.....	ton	23	10	0	to	24	0	0
Caustic, 76%.....	ton	25	0	0	to	25	10	0
Hypsulphite, powder, 85%.....	lb.	0	2	3	to	0	2	6
Hypsulphite, commercial.....	ton	13	10	0	to	14	0	0
Nitrite, 96-98%.....	ton	32	0	0	to	34	0	0
Phosphate, crystal.....	ton	19	10	0	to	20	0	0
Perborate.....	lb.	0	1	3	to	0	1	4
Prussiate.....	lb.	0	0	9½	to	0	0	10
Sulphide, crystals.....	ton	13	0	0	to	14	0	0
Sulphide, solid, 60-62%.....	ton	21	10	0	to	23	10	0
Sulphite, cryst.....	ton	13	0	0	to	14	0	0
Strontium carbonate.....	ton	60	0	0	to	65	0	0
Strontium Nitrate.....	ton	60	0	0	to	62	10	0
Strontium Sulphate, white.....	ton	7	10	0	to	8	10	0
Sulphur chloride.....	ton	25	0	0	to	27	10	0

	Per	£	s.	d.	to	£	s.	d.
Sulphur, Flowers.....	ton	13	0	0	to	14	0	0
Roll.....	ton	13	0	0	to	14	0	0
Tartar emetic.....	lb.	0	1	6½	to	0	1	7
Tin perchloride, 33%.....	lb.	0	1	2	to	0	1	4
Perchloride, solid.....	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)...	lb.	0	1	5	to	0	1	6
Zinc chloride, 10% Tw.....	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%.....	ton	35	0	0	to	40	0	0
Oxide, 99%.....	ton	39	0	0	to	40	0	0
Dust, 90%.....	ton	45	0	0	to	47	10	0
Sulphate.....	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.	to	£	s.	d.
Alphanaphthol, crude.....	lb.	0	2	3	to	0	2	6
Alphanaphthol, refined.....	lb.	0	3	0	to	0	3	3
Alphanaphthylamine.....	lb.	0	2	0	to	0	2	3
Aniline oil, drums extra.....	lb.	0	1	0	to	0	1	1
Aniline salts.....	lb.	0	1	1	to	0	1	2
Anthracene, 40-50%.....	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)...	lb.	0	3	9	to	0	4	3
Benidine, base.....	lb.	0	5	9	to	0	6	0
Benidine, sulphate.....	lb.	0	5	9	to	0	6	0
Benzoic acid.....	lb.	0	1	7½	to	0	1	9
Benzoate of soda.....	lb.	0	1	6	to	0	1	7
Benzyl chloride, technical.....	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate.....	lb.	0	4	9	to	0	5	0
Betanaphthol.....	lb.	0	1	9	to	0	2	0
Betanaphthylamine, technical.....	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis.....	lb.	0	3	6	to	0	3	9
Dichlorobenzol.....	lb.	0	0	9	to	0	0	10
Diethylaniline.....	lb.	0	2	9	to	0	3	0
Dinitrobenzol.....	lb.	0	1	3	to	0	1	4
Dinitrochlorobenzol.....	lb.	0	0	10	to	0	1	0
Dinitronaphthalene.....	lb.	0	1	4	to	0	1	5
Dinitrotoluol.....	lb.	0	1	5	to	0	1	6
Dinitrophenol.....	lb.	0	2	9	to	0	3	0
Dimethylaniline.....	lb.	0	2	6	to	0	2	9
Diphenylamine.....	lb.	0	4	3	to	0	4	6
H-Acid.....	lb.	0	6	6	to	0	7	0
Metaphenylenediamine.....	lb.	0	5	6	to	0	5	9
Monochlorobenzol.....	lb.	0	0	10	to	0	1	0
Metanilic Acid.....	lb.	0	6	0	to	0	6	6
Monosulphonic Acid (2.7).....	lb.	0	5	6	to	0	6	0
Naphthionic acid, crude.....	lb.	0	3	3	to	0	3	6
Naphthionate of Soda.....	lb.	0	3	3	to	0	3	6
Naphthylamin-di-sulphonic-acid..	lb.	0	4	0	to	0	4	3
Neville Winther Acid.....	lb.	0	7	9	to	0	8	0
Nitronaphthalene.....	lb.	0	1	4	to	0	1	5
Nitrotoluidol.....	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base.....	lb.	0	10	0	to	0	10	5
Orthodichlorobenzol.....	lb.	0	1	0	to	0	1	1
Orthotoluidine.....	lb.	0	1	6	to	0	1	9
Orthonitrotoluidol.....	lb.	0	0	10	to	0	1	0
Para-amidophenol, base.....	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor.....	lb.	0	10	6	to	0	11	0
Paradichlorobenzol.....	lb.	0	0	6	to	0	0	7
Paranitraniline.....	lb.	0	3	6	to	0	3	9
Paranitrophenol.....	lb.	0	2	3	to	0	2	6
Paranitrotoluidol.....	lb.	0	5	0	to	0	5	3

Potash

THE Alsace-Lorraine Development Co., Ltd., report: As compared with the spring season last year, there is now a greater opportunity for merchants to purchase their supplies ex-ship and thus avoid extra charges for handling and storage. Stocks on hand of the various grades of potash now most in demand are very low, and it seems probable that some delay may be occasioned later when large orders have to be sent forward from the ports during the height of the planting season when the railways are congested with seeds and manures. Buyers would, therefore, be well advised to send in their orders now for the grades of potash which will be needed for the root crops, kainit 14% and sylvinit 20%. Current quotations are as follow:—

	£	s.	d.
Kainit 14%, f.o.r. in bags London.....	2	12	6
Sylvinit 20%, f.o.r. in bags London.....	3	12	6
Sylvinit 30%, f.o.r. in bags London.....	5	12	6
Muriate of Potash 50%, f.o.r. in bags London.....	10	10	0
Sulphate of Potash 48%, f.o.r. in bags London.....	14	10	0

Unit Prices:

	s.	d.
Kainit 14%.....	3	9 per unit
Sylvinit 20%.....	3	7 "
Sylvinit 30%.....	3	9 "
Muriate of Potash 50%.....	4	2 "
Sulphate of Potash 48%.....	6	0 "

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

GLASGOW, MARCH 29, 1922.

BUSINESS has been rather slow this week, but prices have been fairly well maintained. The buyer still has the market in his favour.

Alkali products for home consumpt are moving very slowly.

Reductions are advised in bichromates of soda and potash to 5½d. and 6½d. per lb. respectively.

Lower prices are being quoted for some coal tar products and intermediates, but the volume of business passing is small.

Industrial Chemicals

ACETONE.—Spot supplies limited and price inclined to harden ; now £74/75 per ton.

ACID ACETIC.—Stocks apparently low. Glacial quoted £57 to £60; 80% B.P. £48 to £50.

ACID BORACIC.—Usual small local demand. Crystals or granulated £60 per ton. Powdered £62 per ton, carriage paid, minimum ton lots.

ACID HYDROCHLORIC, 28/30°.—No change in price, 6s. 6d. per carboy ex works. Very poor demand.

ACID OXALIC.—Slight inquiry for export. Continental offers of 7d. per lb. c.i.f. U.K. ports.

ACID SULPHURIC.—Usual small local demand. Prices for full wagon loads in carboys 144° £4 per ton; 168° £7 5s. per ton. De-arsenicated £1 extra.

ACID TARTARIC.—Crystals offered from Continent at 8d. per lb. f.o.b.

ALUM POTASH.—Very little inquiry. Spot lots to be had at £15 ex store.

AMMONIA MURIATE.—Galvanisers quality quoted at £34 10s. f.o.r.

AMMONIA SALAMMONIAC.—Crystals: Market is easier at £58 per ton.

AMMONIA SULPHATE.—Supplies limited. Price: 25¼%, £15 10s.; 25¾% neutral quality, £16 13s. ex works to buyers' own vehicles.

ARSENIC WHITE POWDERED CORNISH.—In poor demand. Price about £40 to £41 ex quay.

BARYTES.—English makers quoting rather lower. Good qualities on offer at £4 per ton f.o.r. works.

BLEACHING POWDER.—Still no change in price for spot delivery. Quoted £14 ex station.

BORAX.—Slight inquiry, crystal or granulated £29 per ton minimum ton lots; powdered £1 per ton extra.

CALCIUM CARBIDE.—Price remains unchanged at £20 per ton ex store. In poor demand.

CALCIUM CHLORIDE.—Home makers advise reduction in price of £1 per ton, as from 1st prox., to be £6 10s. ex quay or station.

EPSOM SALTS.—Fair inquiry. Commercial quality £9 5s. B.P. £10 10s. per ton delivered.

GLYCERINE.—Pale straw refined: small demand £98 per ton. LEAD ACETATE.—Cheap Continental quotations of £31 c.i.f. for White Crystals.

LEAD NITRATE.—Quoted £45 per ton f.o.b. in usual cask.

LEAD, RED.—£34 10s. per ton ex station. Very little inquiry.

LEAD, WHITE.—£49 per ton ex station. Very little inquiry.

LITHARGE.—Ground Canary: Moderate inquiry. Price £34 to £36 per ton, carriage paid according to quantity.

MAGNESITE.—In fair demand. Spot lots £12 per ton ex store.

MAGNESIUM CHLORIDE.—Moderate business done at £7 per ton c.i.f. Spot lots £8 per ton ex store.

NAPHTHALENE.—Slight export inquiry. Price about £16 to £17 for Fine White Flakes.

POTASSIUM BICHROMATE.—Makers advise a reduction in price. Now 6½d. per lb. delivered.

POTASSIUM CARBONATE, 90/92%.—Very little demand. Price about £28 per ton ex station.

POTASSIUM CAUSTIC, 88/92%.—Continental quotations of £30 c.i.f. U.K. Spot lots £34 per ton.

POTASSIUM CHLORATE.—No change at 5d. per lb.

POTASSIUM PERMANGANATE.—Continent offering at 8½d. per lb. f.o.b. Hamburg.

POTASSIUM PRUSSIAN.—About 1s. 2d. to 1s. 3d. per lb.

SODIUM BICHROMATE.—Makers advise a reduction in price. Now 5½d. per lb. delivered.

SODIUM CARBONATE (REFINED ALKALI).—In little demand. Spot lots £9 12s. 6d. per ton ex quay.

SODIUM CARBONATE (SODA CRYSTALS).—Price remains unchanged at £6 10s. per ton, ex quay or station.

SODIUM CAUSTIC.—70/72%, £23 10s.; 76/77%, £25 10s. per ton ex station. Little demand. 60%, £26 ex station. Slight inquiry for this strength for local use. 98%, powdered £29 to £30 ex station. Slight demand for small lots.

SODIUM HYPOCHLORITE (15% CHLORINE).—£13 5s. per ton ex works.

SODIUM HYPOSULPHITE.—Commercial crystals about £14 to £14 10s. per ton; Pea Crystals £19 10s. to £20 ex station.

SODIUM NITRATE, 95%.—£14 17s. 6d. f.o.r. Refined 96%, £15 2s. 6d. per ton.

SODIUM NITRITE, 100% BASIS.—Price about £30 to £32 per ton. Slight demand.

SODIUM SILICATE, 140°.—Price £10 to £11 ex station according to quantity. In little request.

SODIUM SULPHATE (SALTCAKE, 95%).—Price remains £4 per ton but cheaper parcels being offered at about £3 17s. 6d. per ton f.o.b. U.K. port.

SODIUM SULPHATE (CRYSTAL GLAUBERS).—Slight inquiry for small lots. Fine White Commercial Crystals £5 10s. ex store. B.P. quality £7 10s. ex station.

SODIUM SULPHIDE, 60/65%.—Solid quoted £21 per ton; "Broken" £23 per ton.

SODIUM SULPHITE CRYSTALS.—Price about £13 to £14 per ton ex station. Practically no demand.

SULPHUR FLOWERS, £14 per ton; SULPHUR GROUND, £13 per ton; SULPHUR ROCK, £12 per ton; SULPHUR ROLL, £13 per ton.—All ex store. Slight demand for Rock and Ground; inclined to be easier in face of near arrivals.

ZINC SULPHATE.—A few inquiries. Price £17 to £18 per ton ex station.

ZINC DUST, 98/99%.—Poor demand. Offered at £35 per ton c.i.f. U.K. port.

NOTE.—The above prices are for bulk business, and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ACETONE OIL.—Poor demand. Light £60 per ton c.i.f. U.K. port. Heavy, £55 per ton c.i.f. U.K. port.

BENZIDINE BASE.—Lower prices quoted by English makers. Several inquiries. Price 6s. 6d. per lb. 100% basis, carriage paid, casks free.

BENZOL is being more freely offered. Crude, 65% at 120°C., 1s. 7½d. per gallon, delivered. Pure, 2s. 8d. per gallon, delivered.

DIMETHYLANILINE.—Some inquiries. Price quoted, 2s. 9d. per lb., drums extra; or 2s. 10d., drums included.

FLAKE NAPHTHALENE.—Small inquiries. Price quoted, £18 per ton.

"H" ACID.—Price remains unchanged, at 7s. per lb. delivered.

KETONE.—No demand. £50 per ton c.i.f. U.K.

METHYL ALCOHOL.—Pure 99/100% on offer at £78 per ton c.i.f. U.K. port. Raw 72%, £70 per ton c.i.f. U.K. port.

MONOCHLOROBENZOL.—Some export inquiries. Price quoted, £80 per ton f.o.b., drums included.

PARANITRANILINE.—Some inquiry. Price lower, at 3s. 6d. per lb. delivered.

WOOD NAPHTHA (DENATURING).—4s. 11d. per gallon ex store.

WOOD SPIRIT OIL.—£60 per ton c.i.f. U.K. port.

Research on Colorado Shales

At the Boulder, Colorado, office of the U.S.A. 'Bureau of Mines the co-operative oil-shale laboratory has been enlarged and much new equipment has been added preparatory to more extensive work on Colorado shales. Important changes have been made in the temperature measuring apparatus. A new installation of pyrometers in the retort proper and the retort furnace is expected to indicate more accurately the temperature of the shale in the retort and also make possible more definite control of retorting conditions.

German Chemical Trade Notes

FROM OUR OWN CORRESPONDENT

Berlin, March 27, 1922.

THE latest depreciation of the mark has given rise to a rumour that bank-notes of the nominal value of 10,000 marks may be issued shortly. An increasing need among manufacturers for credit is apparent, as is a corresponding reluctance on the part of the banks to grant credits. Feeling as to the results of the Genoa Conference is pessimistic. Although many factories are running full time on new orders, it is feared that the improvement is not a real one, and is only due to a general fear of further advances in prices. Export trade is suffering from recent increases in overhead charges; in this connexion it is reported that English coal is at present cheaper in Germany than the domestic material.

As indicated last week, the situation in the soda industry is alarming, and it is inevitable that consuming industries will suffer. A serious shortage of glass is hampering the pharmaceutical chemical industry, although business generally on this market is fairly satisfactory. The products most in demand have been potassium permanganate, tartaric acid, and cream of tartar. Sales of dyestuffs to the Austro-Hungarian States, Finland and Belgium, have declined, but a slight improvement was noted in exports to Sweden, Norway, Denmark, and Holland. The increased price of Swiss dyes has reduced their capacity for competing with the German products. The position in regard to glues is unfavourable. Photographic fine chemicals have met with a ready market, and business has been generally satisfactory.

Large orders have been received by the potash industry, but the coal shortage has rendered it difficult for the producers to meet the demand. The increase in potash prices proposed by the Kali syndicate, which appeared on March 21, adds a further 21% to the previous charges. Orders for prompt delivery up to February 27 were executed by the Kali syndicate at the old rates. In the event of a further advancement of coal prices by April 15, a commission of six members of the Reichskabinett will fix the new rates.

Among recent company registrations is that of the Donauwerke A. G. für Kalkindustrie, Muenchen, which has been established with a capital of two million marks to operate the limestone-pits and plants of Ernst Cetto in Saal and Kehlheim a.D. The company propose to acquire similar plants in the near future. Among the directors are Geheimrat Poehlmann of the Bayrische Vereinsbank, and Geheimrat Caro of the Bayrische Stickstoffwerke.

Some industrial chemicals have been unquoted during the week. Stocks are depleted, and prices are varying widely on spot. The following quotations are given in marks per kilogram, unless otherwise stated (d. = domestic price; e. = export price):

Acetic Acid—the associated factories have advanced their prices. Market-quotations are: 80% chemically pure, 40 mk. e; glacial, 52/59 mk. d. Acetyl-Salicylic Acid, 260 mk. d.; 320/325 mk. e., Benzoic Acid, 90 mk. d.; 100 mk. e. Citric Acid, 280 mk. d.; 295 mk. e. Gallic Acid, crystallised, 300 mk. d.; powdered, 310 mk. d.; makers' prices were higher. Oxalic Acid, 98/100%, 70/75 mk. e.; in good demand for export. Pyrogallallic Acid is quoted at 630 mk. d. for crystallised; resublimed is 680 mk. d. Salicylic Acid, 125 mk. d.; 150 mk. e. Tartaric Acid, crystallised, 125 mk. d.; 140 mk. e.; powdered, 125 mk. d.; 140 mk. e.; in fair demand. Alumina Sulphate, 14/15%, 6.75/7.25 mk. e.; 17/18%, 11 mk. e. Ammonia Carbonate, powdered, 17/19 mk. d.; 26 mk. e. Barium Chloride, 11/13 mk. d.; 15/16 mk. e. Bleaching Powder, 110/115, 13.50 mk. e. Borax, crystallised, 34.50 mk. d. inclusive packing. Calcium Chloride, 70/75%, 5/5.25 mk. e. Copperas, 5.60/6 mk. e. Copper Sulphate, 98/100%, in strong demand at 34 mk. d.; 36 mk. e. Magnesium Chloride, fused, in fair demand at 6/6.50 mk. e. Potassium Carbonate, 80/84%, 19 mk. d.; 90/95%, 21 mk. d.; 96/98%, 25/27 mk. d.; 33 mk. e. Potassium Caustic, 88/92%, 25.50/26 mk. d.; liquor 50° Bé, 14/16 mk. d.; 18/20 mk. e. Potassium Chlorate, 30/32 mk. d.; 33/35 mk. e. Potassium Cyanide, 98/100%, 65 mk. d. Salt Cake, 3.50 mk. d.; 4.25/4.75 mk. e. Soda, crystallised, 4.50/5 mk. d.; 4.80/5.25 mk. e. Soda Ash, 96/98%, 11 mk. e. Sodium Caustic, 125/128°, 27.75 mk. d.; 27/28.50 mk. e.; liquor, 38/40°, 9.50 mk. d. Sodium Hyposulphite, crystallised, 12/13 mk. d.; 14/16 mk. e. Sodium Silicate, 38/40°, 5.50/6 mk. e. Sodium Sulphide, 60/62%, 20/23 mk. d.; 21/24 mk. e. Zinc Chloride, 19/21 mk. d.; 20/22 mk. e. Lead, Red, pure, 33.50 mk. d.; commercial, 33/34 mk. d.; 34/36 mk. e. Lead, White, powdered, 34/37 mk. d.; 35/38 mk. e.; in oil, 32/33 mk. d.; 33/36 mk. e. Lithopone, red-seal, 15/17 mk. d.; 23 mk. e. Zinc White, red-seal, 32/34 mk. d.; 45 mk. e.; green-seal, 32.50 mk. d. Benzaldehyde, 65 mk. d.; 76 mk. e. Naphthalene, pure, in flakes, 12/13 mk. d.; 15.50/17 mk. e.

Co-partnership in Industry

AT a luncheon given at the Hotel Metropole, London, on Wednesday, by the Labour Co-partnership Association, Lord Leverhulme said that in the present commercial crisis the firms with which he was connected had weathered the storm, and the central fact that had enabled them to do so was that they had 11,000 co-partners who had given them their fullest support. There was no soothing syrup in co-partnership, and it was not a short cut to greater profits. If there was to be co-partnership it must be on a broad-gauge system, which required that they should be interested in their homes, in their country and its prosperity, and lastly, in the prosperity of the world. This could only be achieved by increased output. Mr. D. Milne Watson gave an outline of the scheme of co-partnership operating in his company, where there were, he said, 10,600 co-partners who held £388,000 of ordinary stock. In addition, the employees had invested £90,000 of their own savings in the ordinary stock of the company. The scheme was managed by a co-partnership committee, and every man had a balance-sheet and knew how the company worked.

Heat Tests in Distillation of Coal

AN investigation regarding the heat of distillation of coal is being conducted at the Pittsburgh Experiment Station of the U.S.A. Bureau of Mines. This investigation has for its object the determination of the amount of heat evolved or absorbed through chemical reaction during the process of destructive distillation of coal. Such information should be of value to the by-product coking and gas industries in that it will give them a more accurate knowledge of the thermal requirements of their ovens and retorts. The problem is being attacked by distilling small amounts of coal in a bomb calorimeter, the necessary energy being supplied electrically and being accurately measured by electrical means. The heat effect of the standardised amount of electrical energy required to distil the coal is measured in the calorimeter and compared with the effect of the same amount of energy supplied to the products of distillation in the calorimeter during a parallel experiment. The difference between the two effects gives the reaction heat of the coal, positive or negative, as the case may be.

New Cotton Research Laboratories

THE laboratories established at the Shirley Institute, Manchester, by the British Cotton Industry Research Association were formally opened on Tuesday by the Duke of York. In the course of his address the Duke said that the future well-being of the people was immeasurably bound up with education and research, and that if their conditions were to be improved we must keep ahead of the world in knowledge. We should do so by experiment and research such as was carried out at that institution. Mr. Kenneth Lee, who presided, speaking of the support behind the institution, said that 90 per cent. of spinners, weavers, dyers, finishers, and printers were members of the Research Association, and that the council included all sections of the trade, scientific men, and leaders of the operatives' associations. After the proceedings the laboratories were thrown open for inspection.

The Institute of Metals

A BALLOT for the election of members and student members of the Institute of Metals will be held at noon on Wednesday, April 19, in connexion with the twelfth annual May lecture. This lecture is to be delivered on Wednesday, May 3, by Professor Sir Ernest Rutherford, F.R.S., of Cambridge University, on "The Relation of the Elements." Membership application forms and cards of invitation to the lecture may be obtained on application to Mr. G. Shaw Scott, M.Sc., the secretary of the Institute of Metals, 36, Victoria Street, London, S.W. 1.

The Royal Society of Arts

THE Royal Society of Arts, which was founded in 1754, has bought the freehold of its premises in John Street, Adelphi, London, for £50,000. Thanks to the munificence of an anonymous donor who has given £30,000 to the fund, and other subscribers, £42,000 has already been received, and it is hoped that the whole £50,000 will be secured at an early date.

Company News

BRITISH GLUES & CHEMICALS, LTD.—The directors regret that, owing to the continued serious depression in trade, it has been found necessary to postpone payment of the half-yearly dividend on the 8 per cent. cumulative preference shares due to-day (Saturday).

ARIZONA COPPER CO.—The directors announce that the Phelps-Dodge Corporation have declared a quarterly dividend of 1 per cent. actual, or at the rate of 4 per cent. per annum, payable April 3. This, on the 50,000 shares held by this company, will amount to \$50,000, subject to British taxation.

ALIANZA CO., LTD.—The annual meeting will be held at Calle Prat 136, Valparaiso, Chile, on June 6, at 3 p.m., and the transfer books will be closed from May 23 to June 6. According to a message from the local board in Valparaiso the gross profit for 1912 was £78,000 and the net profit £3,000. The local board have decided to recommend a final dividend of 25s. per share (25 per cent.), making the total dividend for the year 40 per cent., and leaving £494,000 to be carried forward.

TARMAC, LTD.—The net profit for 1921, after providing general establishment charges, income-tax, and corporation tax, and including £2,876 from subsidiary undertakings as interest, was £83,681, and £4,043 was brought in, making £87,724. The directors have set aside to meet depreciations of works and equipment £17,851, and recommend a final dividend of 2s. per share on the old fully-paid ordinary shares and 1s. 4½d. per share on the 1920-21 issue, making 15 per cent., less tax, on the amount paid up, transferring to general reserve £5,000, carrying forward £7,024.

BRITISH ALUMINIUM CO.—The report for 1921 stated that the depreciation reserve account, including £20,000 applied out of the profits of the year, now stands at £570,000, and the redemption accounts created out of revenue in respect of prior lien debentures and the debenture stock of the company amount to £217,174, making together a total of £787,174. The reserve account, including £10,000 set aside out of the profits of the year, now amounts to £180,000. Considerable additions at the Alumina Works in Scotland and at the rolling mills at Milton and Warrington, England, which were commenced in 1920, were practically completed during the year.

COAL, PEAT, AND OIL, LTD.—The report for the year to August 31 last states that the result of the year's business has not yet shown a profit, due to the general upset of industrial affairs, which not only stopped operations by the company, but also brought about the closing down of the factories from which gradually increasing purchases were being made. The directors are glad to state that conditions of business appear to be showing an improvement, and with the new arrangements of working which have been entered into, they are very hopeful that before the end of the current year a radical change will have taken place. The annual meeting was held yesterday (Friday) at Winchester House, London.

YORKSHIRE INDIGO, SCARLET, AND COLOUR DYERS.—According to the report for 1921 the amount brought in was £8,149. From this has to be deducted £2,175, the loss for the past year, after providing for depreciation of dye-houses, leasehold property, plant and machinery, and all other charges, and after bringing to credit the sums recovered for E.P.D., leaving £5,974. Interest on debenture stock for year and loss on investments realised absorbed £5,514, leaving £460. Add balance of reserve for deferred additions, repairs, and renewals, £8,115, making £8,575, to be appropriated as follows: Dividend on preference and ordinary shares at 5 per cent. for year, less tax, £5,823; carry forward, £2,752. £8,000 transferred from reserve fund to the credit of a special reserve for depreciation on investments, in order to reduce their value to the market price as on December 31, 1921. The annual meeting was held yesterday (Friday) at Atlas Chambers, King Street, Leeds.

LEVER BROTHERS, LTD.—The report for the year ended December 31 last states that the balance of £4,035,516 standing to the credit of profit and loss account, after providing for repairs, renewals, and alterations, depreciation, and insurance, has been appropriated as follows:—Dividend on 7 per cent. preference shares, £1,648,909; dividend on 8 per cent. "A" preference, £1,237,171; dividend on 20 per cent. preferred ordinary, £300,000; dividend on 20 per cent. "B" preferred ordinary, £52,400; dividend on 5 per cent. preferred ordinary, £45,193; co-partnership dividends, £219,715; dividend on ordinary at rate of 10 per cent. per annum, £228,000;

special reserve fund, £250,000; balance carried forward, £54,127. The 3,000,000 subscribed 20 per cent. "A" preferred ordinary shares are held by an associated company, to whom they were allotted in connexion with a proposed purchase. The purchase did not mature and no dividend is payable on these shares. The annual meeting will be held at the Lyceum, Port Sunlight, on April 6, at noon.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Montreal	Bitumastic solution (Dr. A. Smith's)	325
Montreal	Tanning extracts and industrial chemicals	—
Alexandria ..	Coal and oils	—
Johannesburg	Soaps, greases, and oils	331
Copenhagen ..	Industrial chemicals, drugs, dyestuffs, &c.	336
Noviköping, Sweden	Bichromate of potassium, soda, glauber salts, chloride of lime, green and blue vitriol, sulphur, soft soap, glue, china clay, &c.	347
Basle	Vegetable oils	—
Smyrna	Rubber goods and druggists' sundries	—
San Francisco	Cyanide of soda, prussiate of soda, calcium chloride, and soda ash	D.O.T. 14579/ F.W./ S.C. 2
Netherlands East Indies	Yellow soap, calcium carbide....	D.O.T. 14809/ F.W./ P.N.W.

Tariff Changes

KEDAH.—An export duty at the rate of 2½ per cent., *ad valorem*, is levied on coconuts, copra, and betel-nuts as from January 30 last.

NYASALAND.—A list of drugs the importation of which is prohibited, unless authorised by a certificate from the Government, appeared in the Board of Trade Journal (March 23, p. 323).

SOUTH AFRICA.—Under the latest classification of the Customs tariff, ultramarine for manufacturing purposes may be imported free under the general tariff.

FRANCE.—The export prohibition and duties on animal fats, other than fish fats, margarine, oleo-margarine, edible fats, and similar substances, and oleaginous fruits and seeds are withdrawn. The following goods may be exported or re-exported without special authorisation:—Organic manures, molasses, charcoal, natural phosphate of lime, sulphate of ammonia, superphosphates of lime, chemical manures, nitrate of soda, nitrate of lime, and calcium cyanamide.

LITHUANIA.—The tariff and export duties which came into force on January 1 last may be inspected at the Department of Overseas Trade, 35, Old Queen Street, London.

SPANISH POSSESSIONS IN THE GULF OF GUINEA.—A translation of new Customs import and export tariffs relating *inter alia* to oils, colours, chemicals, oleaginous seeds, &c., appeared in the Board of Trade Journal (March 23, p. 325).

A World Tour

CAPTAIN E. WILLIAMS, B.Sc., technical adviser on belt transmission, research chemist and foreign adviser to Lewis & Tyler, Ltd., Gripoly Works, Cardiff, is making a tour of the world for the purpose of conducting propaganda work on behalf of his firm. He is at present in Mexico, and after spending three or four months there will proceed to China, Japan, Siam, the Malay States and the Dutch East Indies. Captain Williams only returned last summer from a 40,000 mile trip in Europe, Egypt, and India.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

BLUNT, W. H. & SON, 70, Snow Hill, Birmingham, chemists. £13 16s. 5d. January 19.
BUCKLEY, PETER, 29, Talbot Street, St. Helens, glass maker. £12 4s. January 31.
BURLINGTON INDUSTRIAL LABORATORIES, LTD., Onslow Mills, Yiewsley, manufacturing chemists. £28 12s. 5d. January 24.
EDWARDS, J. M., 311, Fulham Palace Road, S.W., chemist. £11 12s. 3d. January 26.
HODSON, FRANK, The Ouse, Carlton, patent manure manufacturer. £20 9s. 7d. January 28.
STEWART, J. G., 522, Barking Road, Plaistow, chemist, £10 1s. 6d. January 30.

Bill of Sale

MORRISON, Davis, sen., his wife, and MORRISON, Davis, jun. (trading as D. MORRISON & SON), 467, Romford Road, E., dyers and cleaners. March 27. £180.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

BRITISH GLASS INDUSTRIES, LTD., LONDON, E.C.—Registered March 13, £1,300 debentures part of £400,000; general charge (excluding uncalled capital). *£280,500. October 19, 1921.
HASWELL (C. H.) & CO., LTD., London, N.E., glass manufacturers.—Registered March 10, £250 debenture; general charge.
PARK GREEN DYE WORKS, LTD., Macclesfield.—Registered March 13, charge, to bank; charged on house, dye works and premises at Park Green, Macclesfield. *Nil. June 22, 1921.
SHEAF TURPS PRODUCERS, LTD., Sheffield.—Registered March 11, £150 debenture; general charge. *Nil. December 31, 1921.
SOMERVILLE (W. A.), LTD., Liscard, chemists.—Registered March 11, £300 debentures; general charge. *£350. August 27, 1919.
WYKE FINISHING CO., LTD., Bradford, dyers, &c.—Registered March 18, £1,500 debentures. Present issue £500; general charge.

Satisfactions

SOMERVILLE (W. A.), LTD., Liscard, chemists.—Satisfaction registered March 14, £300, registered September 7, 1916.
WILLOWS, FRANCIS, BUTLER & THOMPSON, LTD., London, E.C., druggists.—Satisfaction registered March 16, £4,700 and £4,600, part of amount registered August 29, 1919.

London Gazette

Companies Winding Up Voluntarily

BRITISH VEGETABLE PRODUCTS, LTD. H. Crewdson Howard, 70A, Basinghall Street, London, E.C., appointed liquidator. Meeting of creditors at the liquidator's office, Monday, April 3, at 12 noon.

ENGLISH GELATINES, LTD. J. Myers, 65, London Wall, E.C. 2, appointed liquidator. Meeting of creditors at the offices of the liquidator, Wednesday, April 5, at 12 noon. Particulars of claims by April 22.
MONTGOMERY (W.) & CO., LTD. L. G. Oldfield, F.C.A., London, appointed liquidator. Meeting of creditors at the offices of W. Montgomery & Co., Ltd., 63, Mark Lane, London, E.C. 3, Friday, April 7, at 12 noon.

Liquidators' Notices

COLOUR OXIDISING CO., LTD., (in voluntary liquidation). Meeting of creditors at the offices of Alan C. Lucas & Co., Aldermay House, 60, Watling Street, London, E.C. 4, Thursday, April 6, at 12 noon.
OXYGEN TRADING CO., LTD., (in voluntary liquidation). Meeting of members of company at 104, Victoria Street, London, S.W. 1, April 24, at 11 a.m.

Bankruptcy Information

BOWMAN, Alexander, The Lowther Arcade and 1, Rickergate, Carlisle, drug store proprietor. Public examination, April 3, 11.30 a.m., Registrar's Chambers, 32, Lowther Street, Carlisle.
STEELE, Leslie Rufus Walter, 7, St. Botolph's Avenue, Sevenoaks, Kent, chemist. First meeting, March 31, 2.30 p.m., 12A, Marlborough Place, Brighton. Public examination, April 26, 12 noon, Town Hall, Tunbridge Wells.

Partnership Dissolved

SUTRO, Leopold, and GOTT, Henry Shearman, oil and sugar refiners, Carrisson Wharf, Wandsworth Bridge, Fulham, under the style of BARRETT, TAGANT & GOTT, and as manufacturers of lanoline at the same place, under the style of THE PHARMACEUTICAL LANOLINE CO., by mutual consent as from June 13, 1921. Debts received and paid by H. S. Gotts, who will continue the business.

New Companies Registered

E. W. ALCOCK & CO., LTD., Wharf Street, Warwick. Manufacturing chemists. Nominal capital, £1,000 in £1 shares.
JAMES B. BERRY'S SONS' CO., LTD., Suffolk House, Laurence Pountney Hill, London. Dealers in oils, soaps, chemicals, &c. Nominal capital, £5,000 in £1 shares.
CARBIDE TRADING CO., LTD., 3, Raymond Buildings, Gray's Inn, London. Dealers in calcium carbide and by products thereof, chemicals, &c. Nominal capital, £100 in £1 shares.
JAMES JAMIESON'S (ABERDEEN), LTD., Albert Oil and Chemical Works, Aberdeen. Manufacturing chemists, &c. Nominal capital, £5,000 in £1 shares.
J. C. LASK, LTD., Camperdown Street, Aldgate, London. Dealers in chemicals, dyes, oils, &c. Nominal capital, £2,000 in £1 shares.
M. & M., LTD., 597, Salisbury House, London Wall, London. Dealers in heavy and fine chemicals, dyes, &c. Nominal capital, £10,000 in £1 shares.
PRODUITS CHIMIQUES, LTD., manufacturers of and dealers in chemicals, dyes, &c. Nominal capital, £1,000 in 2s. shares. A subscriber: H. E. Warner, 1, Great Winchester Street, London.
RALPH OSTLER & CO., LTD., Market Place, Selby, Yorkshire. Dealers in nitrates, fertilisers, &c. Nominal capital, £5,000 in £1 shares.
WHITEHEAD CONTINUOUS OIL EXTRACTING PROCESS, LTD., seed crushers, manufacturers of linseed, cotton and other cakes, oil or grease extractors by crushing, chemical, solvent or other processes; soap boilers, &c. Nominal capital, £2,500 in £1 shares. A subscriber: M. Whitehead, 53, New Bridge Road, Hull.

Recent Wills

Mr. George Henry Holden, of Chorlton-cum-Hardy, Manchester, manufacturing chemist. £50,737
Mr. Robert Paul, Inchkeith, Mount Vernon, Glasgow, bottle manufacturer, a director of the British Association of Glass Bottle Manufacturers £66,108

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